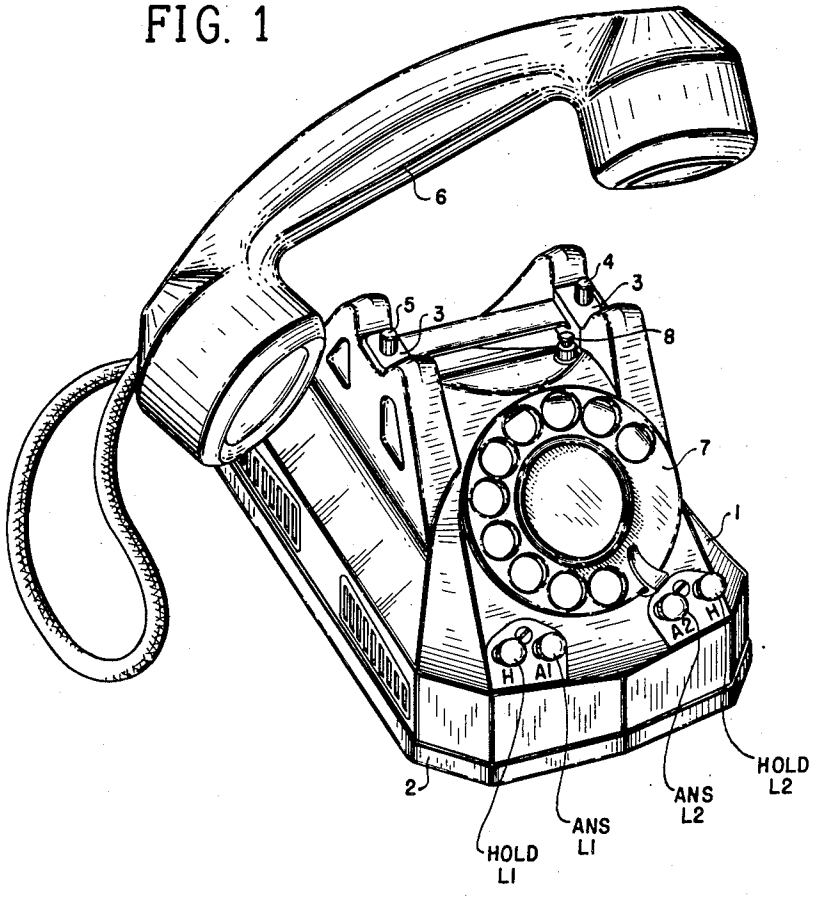
Feb. 5, 1957 L. SCHAUFUSS 2,780,677

MULTI-LINE TELEPHONE SUBSTATION

Filed March 18, 1955 5 Sheets-Sheet 1

FIG. 1



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MULTI-LINE TELEPHONE SUBSTATION

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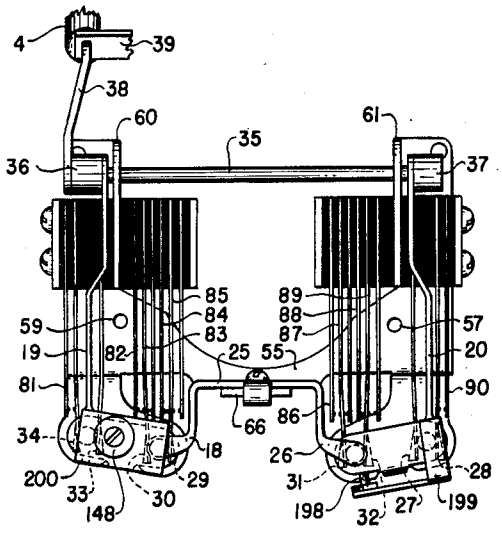


FIG. 3

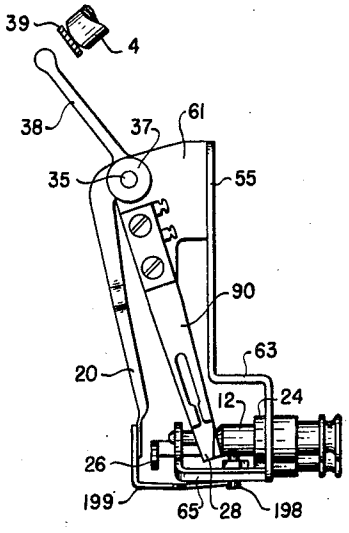


FIG. 4

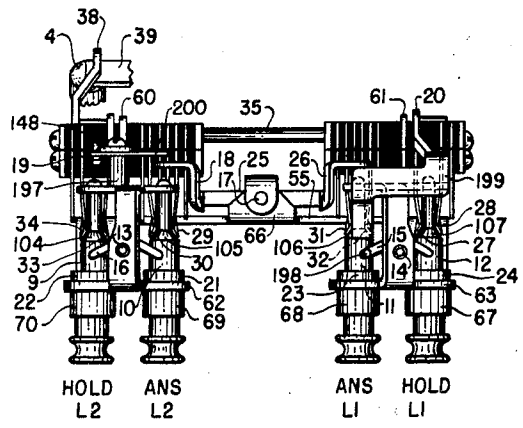


FIG. 2

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MULTI-LINE TELEPHONE SUBSTATION

Filed March 18, 1955 5 Sheets-Sheet 3

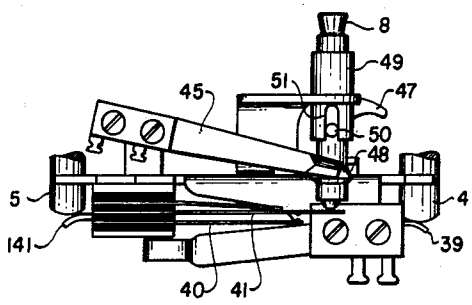


FIG. 6

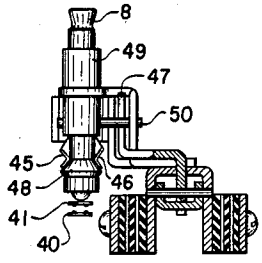


FIG. 5

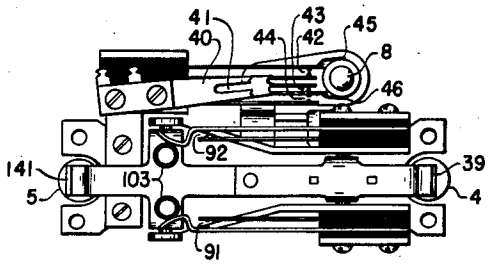


FIG. 7

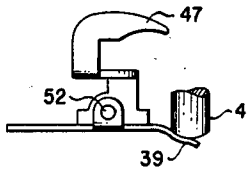


FIG. 8

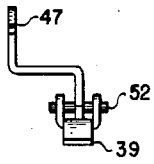


FIG. 9

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MULTI-LINE TELEPHONE SUBSTATION

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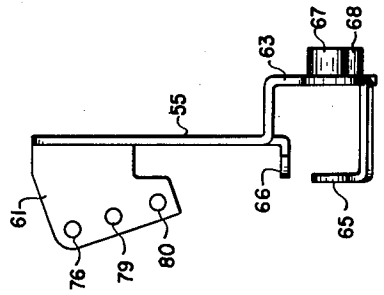


FIG. 11

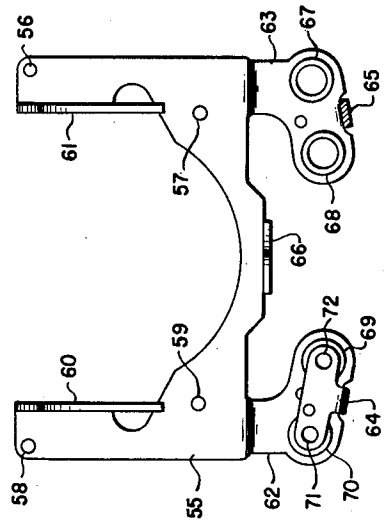


FIG. 10

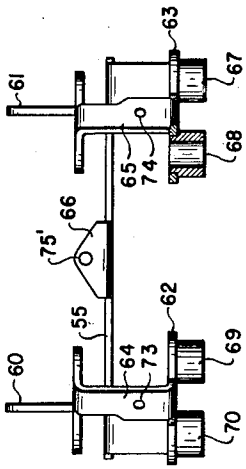


FIG. 13

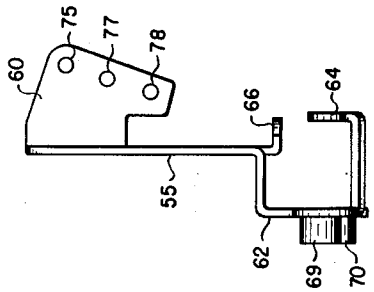


FIG. 12

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MULTI-LINE TELEPHONE SUBSTATION

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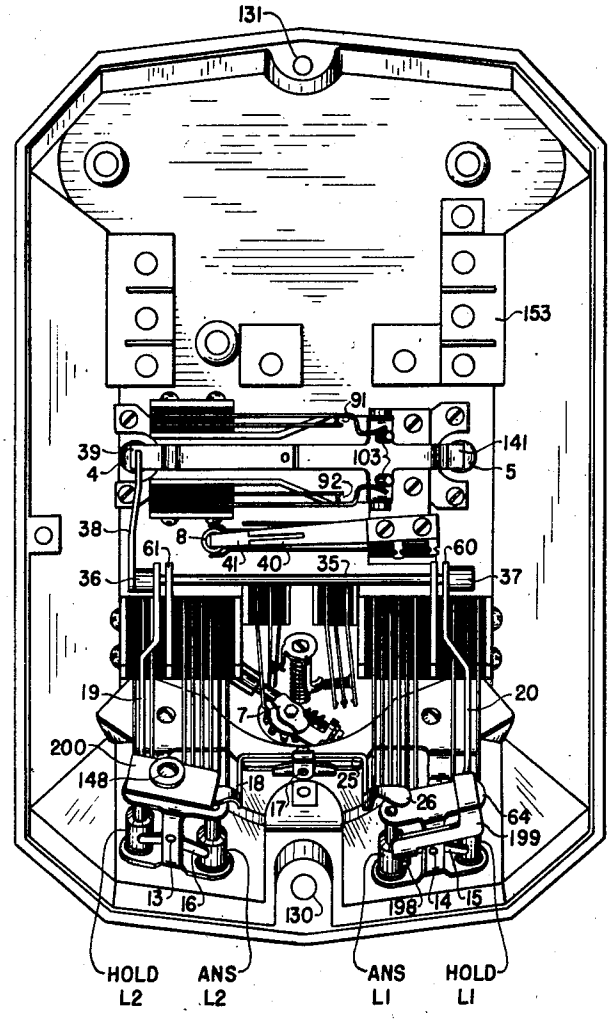


FIG. 14

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United States Patent Office 2,780,677 Patented Feb. 5, 1957

2,780,677

MULTI-LINE TELEPHONE SUBSTATION

Leif Schaufuss, Chicago, Ill., assignor to Automatic Electric Laboratories, Inc., Chicago, Ill., a corporation of Delaware

Application March 18, 1955, Serial No. 495,182

6 Claims. (Cl. 179—99)

This invention relates in general to telephone systems, but more particularly to substation instruments, and the main object is to increase the usefulness of telephone instruments and to facilitate the acts required to manipulate them.

It has been the practice heretofore to provide subscribers' substations with means enabling them to perform certain switching operations apart from those which usually result from the removal and replacement of the telephone instrument with respect to the hookswitch or cradle. For example, a pair of keys (Answer and Hold) for each line of a plurality of lines leading to one telephone handset for intercommunication. Keys have also been used for switching a call to an extension telephone.

In the Wood Patent No. 2,589,180 issued March 11, 1952, there is provided a telephone and circuits for answering and holding on two lines, with answering on a third line, with signalling on an extension line, and with exclusion or inclusion, as may be desired, on the extension line, all controlled by means of keys. The circuits (Figs. 16 and 17) of the Wood patent will therefore be referred to in conjunction with this invention without showing such circuits herein.

It is an object of the invention to provide a telephone instrument which enables the subscriber to restore to normal any operated key or push-pull key, by placing the handset on the cradle.

It is a further object to provide a hold and answering key for two lines; a push-pull key for a third line; a signalling means for each line; and means whereby the replacement of the handset restores any answer, hold, or push-pull keys of any or all lines to prevent mistakenly answering future calls over the wrong line due to unrestored keys.

The above objects and those not specifically mentioned will be apparent from the detailed description, which together with the drawings constitute a preferred embodiment of the invention.

In the drawings:

Fig. 1 shows a perspective view of the cradle type telephone containing a number of push button keys and a push-pull key.

Fig. 2 shows a partial front view of the push button key unit removed from the telephone.

Fig. 3 is a top view of the push button key unit as shown in Fig. 2.

Fig. 4 is a side view of the push button key unit taken from the right side of Fig. 3.

Fig. 5 shows an end view of the mechanical structure of the push-pull key partly in section.

Fig. 6 is a front view of the push-pull key arrangement and the cradle, or switch hook assembly unit.

Fig. 7 is a bottom view of the push-pull key and switch hook assembly unit of Fig. 6.

Fig. 8 is a detailed front view of the unlocking arm of the switch hook assembly unit.

Fig. 9 is a side view of the unlocking arm.

Fig. 10 is a plan view of the push button mounting bracket.

Figs. 11 and 12 are each end views of the push button mounting bracket.

Fig. 13 is a view of the push button mounting bracket taken from the lower side of Fig. 10.

Fig. 14 illustrates the arrangement of the apparatus inside the cover of the telephone set.

Referring now to Fig. 1, this telephone instrument is of the same type as shown in Design Patent 117,876, issued November 28, 1939, to H. F. Obergfell, having however push buttons, or answer keys designated A1 and A2, hold keys H and a push-pull button, or key, 8 mounted on the housing, or cover, 1 for enabling this instrument to have various connections to be described more fully hereinafter. The cover 1 has a cradle 3 in which the handset 6 rests when the instrument is not in use. Two plungers 4 and 5 located in the cradle 3 are actuated by removal and replacement of the handset from the cradle. Plunger 4 is the release plunger for controlling the release of any actuated keys when the handset is replaced on the cradle. Flash plunger 5 permits opening and closing of the cradle or switch hook springs, when manually actuated without interfering with the operated condition of any of the push button keys. A well-known dial or calling device, 7 is mounted on the face of cover 1. The answer and hold keys A1, A2 and H mounted on cover 1 below dial 7 as shown and are provided for initiating, answering and holding calls on a pair of lines 1 and 2 which terminate in this instrument in the manner shown in said Wood patent. The push-pull key 8 is mounted on cover 1 as shown and comprises a three position key for controlling, holding and signalling circuits of a third line as shown in said Wood patent.

Referring now to Figs. 2, 3, 4, 10, 11, 12 and 13 which show the detailed construction of the answering and holding push button assembly unit which is mounted inside of cover 1 and located as shown in Fig. 14. This push button assembly unit comprises a base made from a single sheet of metal and bent as shown in Figs. 10, 11, 12 and 13. This base has a flat main body portion 55 with holes 56, 57, 58 and 59 through which screws extend for fastening the base to inserts on the cover 1. Two extension members 60 and 61 extend at right angles from the main body portion 55 and are provided with holes 77, 78, 79 and 80 for mounting the spring assemblies shown in Figs. 2, 3 and 14. Holes 76 and 75 are provided in the extension members 61 and 60 for rotatably mounting shaft 35, shown in Figs. 2, 3 and 14. Integral arms 62 and 63, at the outside edges of the main body portion 55, are bent at right angles as shown in Figs. 11 and 12 to form ears as shown in Fig. 10. A pair of holes are drilled in each of these arms, and sleeves, such as 67, 68, 69 and 70, are fitted into these holes and welded to arms 62 and 63 to provide mounting sleeves for the round push buttons, such as shown in Fig. 2. Further continuations of the base such as continuations 64 and 65 extend from the arms 62 and 63 as shown in Figs. 11, 12 and 13 and form ears having holes, such as holes 71 and 72, through which the reduced diameter of the push button keys extend, thereby acting as guides for the push button keys as well as back stops for lever arm 25 shown in Fig. 2. Holes 73 and 74 are provided in the continuations 64 and 65 for rotatably mounting the lever arms 15 and 16 as shown in Fig. 2. One of the lever arms 15, has a circular projection 198 mounted on one of its ends as shown, for a purpose to be described. A center portion 66 extends from near the middle of the main body portion 55 and has a hole 75 therein for rotatably mounting the lever arm 25, as shown in Figs. 2 and 3.

Referring now to the push button key unit shown in

Figs. 2, 3 and 4 it will be seen that the push button keys, such as Hold L1, Ans. L1, Ans. L2, and Hold L2, are generally round rods of insulating material having different diameters at different locations throughout their length. The upper ends of each push button have circular flanges which extend through the holes provided in the cover to enable the user to push and pull such push buttons. The central portion of each push button is of a diameter slightly smaller than the holes and sleeves 67, 68, 69 and 70 to permit such push buttons to easily slide in such sleeves. A collar, such as collars 21, 22, 23 and 24 is secured to the middle portion of each push button to abut against ears 62 and 63, thereby acting as a stop for each push button. These collars 21, 22, 23 and 24 also cooperate with the levers 15 and 16, when rotated, to return the certain push buttons to their normal positions. The levers 15 and 16 are rotatably mounted on continuation members 64 and 65 in a plane between the push buttons and the continuation members 64 and 65. The circular bevel portions such as 104, 105, 106 and 107 of the push buttons are provided for actuating the extension springs, such as springs 33, 34, 30, 29, 31, 32, 27 and 28, to operate their associated spring control assemblies. The ends of these extension springs are V-shaped to conform to the circular bevel portions and the smaller stem portion of the push buttons so that spring assemblies are operated when the push buttons are depressed. The springs such as 27, 28, 31, 32, 29, 30, 33 and 34 hold their respective push buttons in a depressed position when so operated. The bottom portions of each of the push buttons are of smaller diameter and extend through the holes, such as 71 and 72, in ear portions of 64 and 65 where the ends of the push buttons are engageable by lever ends 18, 19, 20 and 26 for restoring the push buttons to normal when such lever ends are actuated. A lever 25 shown more clearly in Figs. 2 and 3, is pivotally mounted in hole 75' (Fig. 13) of center portion 66 of the base member and has extension arms 18 and 26 for engaging the ends of push buttons 10 and 11 for restoring one of such push buttons to normal when the other push button is actuated; these push buttons being the answer push buttons and are arranged so that the actuation of any one answer push button restores the other answer push button.

A shaft 35 is rotatably mounted in holes 75 and 76 of extension members 60 and 61 for permitting rotation of the lever arms 19 and 20 which are secured to shaft 35 by sleeves 36 and 37 and set screws through such sleeves. Lever arm 19 has one end with a flat plate 200 mounted thereon containing a circular hole so that the plate is guided vertically along a rod 197 (Fig. 2). The flat plate 200 extends over the rear end of hold key L2 and above lever end 18 and the end of answer key L2. Lever arm 20 has a flat member 199 mounted thereon and extending to the left (Fig. 2) and downward directly above the circular projection 198 of the lever arm 15. Lever arm 38 is also permanently secured to shaft 35 and is provided for rotating shaft 35 and lever arms 19 and 20 whenever the member 39 is actuated by depressing the plunger 4 in the cradle. Rotation of the lever arms 19 and 20 cause restoration of the answer and hold push buttons to normal positions when the plunger 4 is depressed by restoration of the handset to the cradle. The spring assembly comprising contact springs 81 to 91, inclusive, are mounted in the usual manner on the extension members 60 and 61. Depression of a push button, such as push button Ans. L2 causes the circular bevel 105 to actuate extension springs 29 and 30 to open contacts 83 and 84 and to close contacts 82 and 85. In a similar obvious manner the other spring assembly contacts are operated by their associated push buttons.

Figs. 5, 6 and 7 show the push-pull key and switch hook assembly unit and the switch hook assembly portion is substantially the same as that shown and described in Patent No. 2,272,474, issued February 10, 1942, to H. F. Obergfell. In this particular instance the push-pull key apparatus has been mounted on an extension of the switch hook bracket so that the assembly forms a unit. The push-pull key 8 is a three position key which is a generally round rod of insulating material having different diameters at different locations throughout its length. The upper end has a circular flange which extends through a hole provided in the cover to enable the user to push and pull such key. The central portion of the push-pull key 8 is of a diameter slightly larger than the diameter of the flange, but of such size as to permit the key to easily slide in the sleeve 49 which is secured to the extension bracket and extends through the cover. The circular bevel portion 48 has a diameter slightly larger than the diameter of the central portion of key 8 and is provided for actuating the extension springs 45 and 46, when the key 8 is in a pull position so as to operate the associated spring contacts 42, 43 and 44. The extension springs 45 and 46 hold the key 8 in the pull position. The ends of the extension springs 45 and 46 are V-shaped to conform to the circular bevel portions. The bottom portion of the key 8 has a smaller diameter than the circular bevel and is used to actuate the extension springs 40 and 41, when the key is in the depressed position so as to operate the associated spring contacts. The extension spring 41 restores the key 8 to its normal position upon the release of the force depressing the key. A restoring pin 50, a round metallic pin, is mounted within the push-pull key 8 with two ends of the pin extending outward from both sides of the push-pull key so as to be perpendicular to the longitudinal axis of the push-pull key 8. As the key 8 is raised to a pull position, one end of the restoral pin 50 will move upward in the keyway 51 guiding the key in the movement, and the other end of the restoral pin, which is the longer end, will move upward to engage the unlocking arm 47. The keyway 51 is a cutaway section of the sleeve 49. The unlocking arm 47, shown more clearly in Figs. 8 and 9, is secured to the member 39 by rivets, and comprises a two-right-angle piece. The upper right angle section has an inner curvature which engages the restoral pin. The lower right angle section is the portion secured to the member 39, and the pivotal pin 52 passes through it. To restore key 8 from the pull position to its normal position, plunger 4 is depressed to actuate member 39. The movements of member 39 causes the unlocking arm 47 to pivot about pin 52 in a rotary movement. In so doing, the upper right angle section of the unlocking arm 47 actuates the restoral pin 50 in a slidable motion causing the key 8 to occupy a normal position. Fig. 6 shows the position of the unlocking arm 47 when the plunger 4 is depressed.

Referring now to Fig. 14 which illustrates the arrangement of the apparatus within the cover 1. The cover 1 is fastened to the base 2 by means of screws through apertures in the base into threaded inserts 130 and 131 in the cover. Ringer coils, magnets, gongs, condensers etc., are omitted to more fully disclose the intended invention.

The cover 1 is the portion of the substation upon which the handset 6 is rested. The cover is formed generally in the shape of a truncated pyramid (Fig. 1). In the center portion of the cover 1 is the cradle 3, which is parallel to the base 2 of the substation. Protruding through the center of the cradle 3 are the plungers 4 and 5 representing the release and flash plungers. The release plunger 4 moves the overlapping member 39; whereas flash plunger 5 moves the member 141. Positioned at both sides of the members 39 and 141 are two sets of switch hook contact springs 91 and 92. Positioned to one side of the level portion of the substation is the push-pull key 8, which protrudes from the outer portion of the substation. The push-pull key 8 actuates the set of contact springs 41—40. In the center of the

inclined portion adjacent to key 8 is the dialling mechanism 7. Two sets of springs are positioned at each side of the dial mechanism 7. The push button keys Ans. L1, Hold L1, Ans. L2, and Hold L2 are positioned in sets so as to have each set on opposite sides of the dialling mechanism. Common to each set of push button keys are the pivotal members 15 and 16, which are centrally located to each set of push button keys so as to be engaged upon operation of each individual set of push button keys. Positioned between the two inner push button keys, Ans. L1 and Ans. L2, is the pivotal member 25. The member 25 extends beyond the dialling mechanism 7 and engages the push button keys Ans. L1 and Ans. L2, when either key is operated. Parallel to the sets of contact springs are the parallel members 19 and 20, which engage the outer push button keys Hold L1 and Hold L2, and with the parallel members respective flat members 199 and 200 engage the inner push button keys, respectively Ans. L1 and Ans. L2. The parallel members 19 and 20 act in response to the movement of shaft 35. The screw and washer combination 148 which is tightly fastened into a threaded insertion of the rod 197, is positioned between push button keys Hold L2 and Ans. L2, and acts as a back stop for the parallel member 19 and the flat plate 197.

The circuits for completing and holding a call over the lines are similar to the circuits and means fully disclosed in the Wood Patent No. 2,589,180, issued March 11, 1952, as before mentioned and need not be further described. The means for restoring any push or push-pull button will now be described in detail.

It will be assumed that push buttons 11 (Ans. L1), and 9 (Hold L2) have been depressed and push-pull button 8 has been pulled up in a manner disclosed, whereby conversation will be considered taking place over line 1, while lines 2 and 3 are being held. The inner end of the push button 11 engages and pivots lever end 26 and the collar 23 engages and pivots one end of lever arm 15, whereby the circular projection 198 engages the bottom end of the flat member 199. The inner end of the push button 9 engages the bottom end of the flat plate 200. The push-pull button 8 will be pulled up, whereby one end of the restoring pin 50 will move upward in the keyway 51 guiding the key in the movement, and the other end of the restoring pin, which is the longer end, will move upward to engage the unlocking arm 47. Replacing the handset 6 on the cradle 3 will cause the depression of the plungers 4 and 5. The plungers 4 and 5 will engage and pivot the member 39 and the member 141 causing; the unlocking arm 47 to pivot, engage and move downward the restoring pin 50 fastened to the push-pull button 8, to move the push-pull button 8 into its normal position; movement of member 38 at its protruding end to rotate shaft 35 to pivot parallel lever ends 19 and 20 whereby the extending end of flat member 199 engages the circular projection 198 of the lever arm 15 to push the collar 24 and push button 11 into its normal position, while simultaneously the flat plate 200 depresses the rear end of the push button 9 into its normal position.

It will be assumed now that the push button 10 (Ans. L2) and 12 (Hold L1) are depressed and push-pull button 8 is pulled up in a manner disclosed, whereby conversation will be considered taking place over line 2 while lines 1 and 3 are being held. The inner end of the push button 10 engages and pivots lever arm 18 until lever arm 18 engages one end of the flat plate 200. The inner end of the push button 12 engages lever arm 20. The push-pull button 8 will move into a position previously described. Replacing the handset 6 on the cradle 3 will cause the depression of the plungers 4 and 5. Plungers 4 and 5 will engage and pivot the member 39 and the member 141 causing; the push-pull button 8 to restore as previously described; pivoting of member 38, rotating shaft 35, pivoting parallel lever ends 19 and 20 causing lever end 20 to restore push button 12 (Hold L1) while simultaneously flat plate 200 pivots lever end 18 to restore push button 10 (Ans. L2).

Restoration of any combination of depressed push buttons can be accomplished without limiting the invention to the assumed examples described, and while the invention has been described with a certain degree of particularity, it should be apparent that numerous modifications may be resorted to without departing from the spirit and scope of the invention as defined in the appended claims.

What is claimed is:

1. In a telephone system, a substation having means for extending connections over a plurality of lines terminating at the substation, including a plurality of answer keys for connecting the substation to different ones of the lines, and hold keys for holding the connection over one line while controlling a connection over another of the lines, and also including switch hook springs and a pair of plungers operated by the removal and replacement of the handset at the substations to control the switch hook springs, the provision of means controlled by one of said plungers, when depressed, for releasing any operated ones of said answer or hold keys, and means controlled by the other of said plungers, when depressed, for controlling said switch hook springs without operating said other plunger controlling the release of said keys.

2. In a telephone system, a substation having means for extending connections over a plurality of lines terminating at the substation, including a plurality of answer keys for connecting the substation to different ones of the lines, and hold keys for holding the connection over one line while controlling a connection over another of the lines, and also including switch hook springs and a pair of plungers operated by the removal and replacement of the handset at the substation to control the switch hook springs, a plurality of pivoted levers having extensions for releasing any operated ones of said answer or hold keys, means controlled by one of said plungers when depressed for operating said switch hook springs and also operating said levers, and means controlled by the other of said plungers, when depressed, for controlling said switch hook springs without operating said levers.

3. In a telephone system consisting of a substation, a handset telephone, a support on said substation, said substation having a first, second and third line terminating therein, a pair of keys for each of two of said lines, a push-pull key for said other line, said keys and said push-pull key having a restored and an operated position, means for restoring one operated key of one pair upon the operation of the other key of said one pair, means for restoring a certain operated key of one of said pairs upon the operation of a certain key of said other pair, the combination therewith of individual elements engaging individual pairs of said keys and said push-pull key for restoring any operated key of either pair regardless of which key is operated or said push-pull key if operated upon the replacement of said telephone handset on said support.

4. In a telephone system, a substation having a first, second and third line terminating therein, holding means individual to each line and operative for closing and opening holding circuits for the associated line, answering means individual to each of two lines for closing and opening answering circuits of the associated line, a supporting member in said substation, a handset for said substation adapted to rest in said supporting member when not in use, parallel operating members each individual to a pair of said holding and answering means for the said first and said second lines, an unlocking member individual to said holding means for said third line, and mechanical means provided for operating said parallel operating and unlocking members to restore any or all operated holding means and any operated answering

means on two of said lines responsive to said handset being placed on said supporting member.

5. In a telephone system, a substation, a support on said substation, a handset telephone, a pair of individual lines, a pair of keys for each individual line, said keys having a restored and an operated position, a pivoted member, means in said support for pivoting said member on replacing the handset in said support, said first pivoted member engaging and operating a second member, parallel members each individual to a pair of lines, an element attached to each said individual parallel member, said parallel members operated by the operation of said member for causing said members and elements to restore any operated key of either pair of keys regardless of which keys are operated upon replacing the telephone handset on said support.

6. In a telephone desk set of the self-contained type containing a cover, a cradle having a pair of plungers thereon, a handset telephone, a first pair of answer and hold push buttons mounted on said cover and extending into the interior portion of said cover, a second pair of answer and hold push buttons mounted on said cover and extending into the interior portion of said cover, a push-pull button mounted on said cover and extending into the interior portion of said cover, a mounting bracket for securing both pairs of push buttons to said cover, a first member mounted on said mounting bracket to engage either push button of said first pair to restore to normal position one of said push buttons of said first

pair in response to the operation of the other push button of said pair, a second member mounted on said mounting bracket to restore one of said push buttons of said second pair to normal position in response to the operation of the other of said push buttons of said second pair, a third member secured to said mounting bracket and positioned between said first pair of push buttons and said second pair of push buttons, said third member operable by a certain push button of one of said pairs of push buttons to restore to normal position a certain other push button of the other of said pairs of push buttons, a restoring means mounted on said mounting bracket comprising two parallel members, a fourth member connecting the said two parallel members and a fifth member secured to the said fourth member, the combination therewith of a projection attached to one of said keys, individual members attached to each parallel member, said restoring means operative in response to replacing said handset on said cradle to operate said fifth member, operation of said fifth member causing one parallel member to release one key of a pair, one individual member to engage said projection to release the other key of the pair, and causing said other individual member to engage and release either key of the other pair which may have been operated.

References Cited in the file of this patent

UNITED STATES PATENTS

2,589,180 Wood ---------- Mar. 11, 1952