

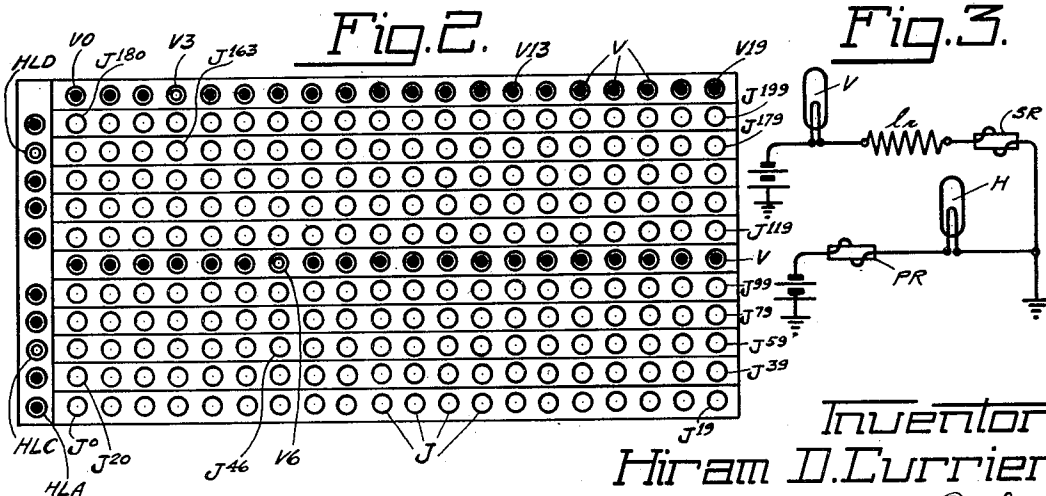
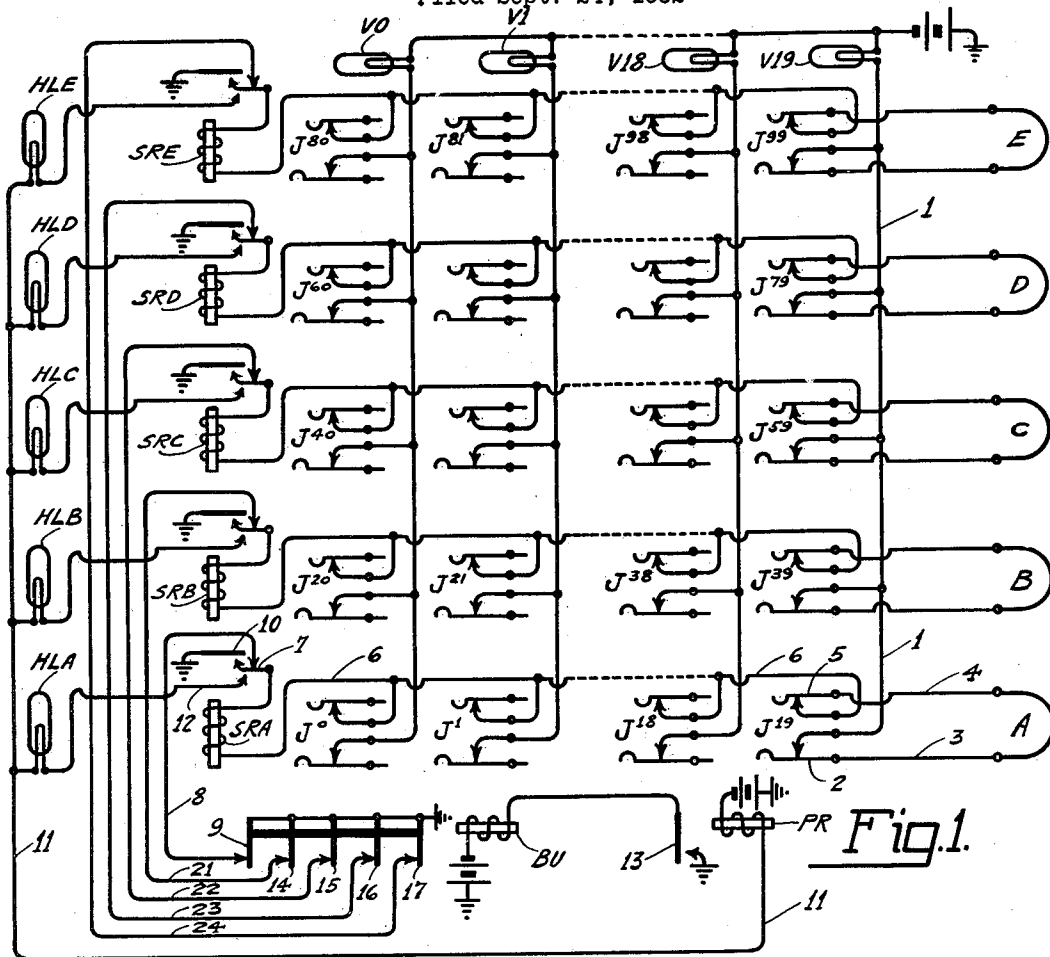
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TELEPHONE SYSTEM

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TELEPHONE SYSTEM

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My invention relates to telephone systems of the manual type wherein the connections between subscribers' lines are established by operators located at switchboards. The subscribers' lines usually terminate at the switchboard in a jack with which is associated a line lamp which lights to indicate to the operator that a subscriber desires attention. Such an arrangement necessitates the provision of a lamp for each jack which, on switchboards of large capacity, requires a considerable amount of space on the front of the switchboard. I overcome this difficulty by a novel arrangement of the jacks and lamps whereby the number of lamps required for the same number of jacks is reduced a very considerable amount and the area on the face of the board required for the appearance of the lines is reduced approximately a corresponding amount.

In the embodiment of my invention shown in the drawing accompanying this description the amount of space saved on the switchboard and the number of lamps used is about 75% of that heretofore required for the same number of lines.

A feature of my invention is the novel arrangement of the jacks and lamps of a telephone switchboard whereby the lines are arranged in groups of any given convenient number which terminate in jacks arranged in rows on the face of the board and a horizontal lamp and a vertical lamp are provided for each row of jacks and are located in alignment with the rows of jacks.

Another feature of my invention is the circuit arrangement whereby two lighted signals are displayed to indicate an incoming call.

Other features will become apparent upon further perusal of the specification and together with the features herein pointed out, will be explained fully hereinafter, reference being had to the accompanying drawing comprising Figs. 1 to 3 inclusive in which like reference characters indicate like parts and in which:

Fig. 1 shows the circuit arrangement of my invention;

Fig. 2 shows the arrangement of the jacks and lamps on the switchboard; and

Fig. 3 shows the operating circuit of the lamps.

One arrangement of the jacks and lamps on the switchboard of my invention is shown in Fig. 2. The lamps and jacks illustrated provide for two hundred lines. The jacks J are arranged in horizontal strips of twenty superposed upon each other until the desired number of jacks are obtained. In the embodiment shown I provide a strip of vertical lamps V for each one hundred lines which lamps are respectively aligned with the vertical rows of the jacks and also a strip of horizontal lamps, one for each horizontal row or strip of jacks. The ratio of lamps to jacks can be varied to suit the conditions for instance one strip of vertical lamps can be provided for every

two hundred lines. The location of the horizontal lamps may be to the right or left of the panel or at any other place therein provided they are aligned with the rows of jacks. Likewise the vertical lamps may be placed at the bottom or top or any intermediate position of the panel provided the alignment of the lamps and jacks is maintained.

In other words, the jacks are arranged in intersecting rows and any calling line and consequently the jack corresponding thereto is indicated by the lighting of the lamps at the ends respectively of the rows of jacks which intersect at the point occupied by the jack of the calling line. In short, it is a co-ordinate arrangement, the lamps at the ends of the intersecting rows of jacks in which the desired jack is located being lighted to indicate the particular jack into which the operator will place the plug of her cord.

The lines are preferably numbered in the usual manner, that is, the lines terminating in the bottom row of jacks being numbered 0 to 19 and those in the next strips 20—39, 40—59, 60—79 and 80—99, respectively. The lines terminating in the jacks of one strip are considered as a group and for each group of lines a horizontal or strip lamp and a strip relay is provided. The strip relay is in multiple circuit with one contact of every jack in the group. The vertical lamps are connected in multiple with a contact of every jack in its associated file or row. Consequently when a subscriber removes his receiver to make a call the vertical lamp V and the horizontal lamp H associated with the jack of his line are illuminated. The operator notices the two burning lamps and plugs into the jack located at the intersection of the strip and file associated with the two lamps. For instance, if line 46 initiates a call the vertical lamp V⁶ and the horizontal lamp HLC will be lighted. The operator notes the vertical lamp V⁶ and follows down the file associated with the burning horizontal lamp HLA and she then plugs into the jack J46 which is connected to the line 46 making the call. The insertion of the plug into the jack extinguishes the lamps and permits the next call to be indicated. A pilot relay PR is provided and co-operates with a busy relay BU to prevent the appearance of a second call at the board should it be made before the first call has been answered.

In Fig. 1 of the drawing I disclose one circuit arrangement of my invention arranged as a unit for one hundred lines. The jacks J0, J1, etc., to J18 and J19 comprise one horizontal strip and are connected to the lines numbered 0 to 19 in Fig. 2; jacks J2 to J17 being omitted for the purpose of illustration. The strip relay SRA has a conductor 6 multiplied to all the jacks J0 to J19

of the strip. Jack J19 has a subscriber's line 3 and 4 connected thereto and A represents the subscriber's loop associated with the line. Each of the jacks is connected to a subscriber's line which may be a single line or a so-called party line. The jacks J19, J39, J59, J79 and J99 comprise a vertical row or file and the vertical lamp V19 is aligned with the said file and is connected in a multiple circuit over conductor 1 with each of the jacks in the file.

Should the subscriber at A desire to place a call at the exchange the operation of the circuit is as follows. The removal of the receiver at the substation A closes the line conductors 3 and 4 in the well known manner to provide an energizing circuit for the vertical lamp V19 and strip relay SRA. This circuit can be traced from grounded battery, thru the lamp V19, conductor 1, normal contact 2 of jack J19, conductor 3, the subscriber's loop A, line 4, normal contact 5 of J19, conductor 6, winding of strip relay SRA, normal contact 7, conductor 8, normal contact 9 of relay SW to ground. The lamp V19 is lighted over this circuit and the strip relay SRA is operated to close an operating circuit for the pilot relay PR and horizontal or strip lamp HLA; current flowing from grounded battery, the winding of pilot relay PR, conductor 11, lamp HLA, conductor 12, alternate contact 10 of SRA to ground. The pilot relay PR closes its alternate contact 13 to cause the energization of the busying relay BU over an obvious circuit which opens its contacts 9, 14, 15, 16 and 17 to remove ground from conductors 8, 21, 22, 23 and 24 to prevent the operation of any of the other strip relays SRB, SRC, SRD or SRE. The relay SRA and the lamp V19 are maintained operated by the closing of alternate contact 10 which supplies ground to the circuit. The energizing circuits of the lamps and relays are shown particularly in Fig. 3 wherein V is the vertical lamp, *h* the resistance of the subscriber's line and H the horizontal lamp. The lamp V19 associated with the file in which the jack of the calling line is located is noticed by the operator who then follows down that file until she comes to the strip associated with the lighted horizontal lamp; she plugs into the jack at the intersection of the strip and file which is the jack of the calling line.

The insertion of the plug into the jack opens the contacts 2 and 5 which interrupt the energizing circuits of the lamps V19 and HLA and the strip relay SRA which restore to normal. The relay SRA restores its contact 10 to normal and thereby interrupts the operating circuit of the pilot relay PR which restores its contact 13 to open the circuit of the busying relay BU which restores its contacts 9, 14, 15, 16 and 17 to again place ground on the conductors 8, 21, 22, 23 and 24 to permit the operation of one of the strip relays to indicate another incoming call.

The upper portion of Fig. 2 discloses the jacks connected with lines 100 to 199 inclusive and the vertical and horizontal lamps associated therewith. The circuit arrangement for these lines is similar to that shown in Fig. 1. Vertical lamp V3 and horizontal lamp HLD are shown as illuminated to indicate a call from line 163 associated with jack J163.

The above described arrangement of jacks and lamps on the switchboard effects a substantial saving in space thus permitting a much greater number of jacks to be provided on the switchboard. Not only does the present arrangement effect an economy in the number of lamp posi-

tions but it is believed that smaller jacks may be used with greater facility with the present arrangement.

While in the present drawing the group of jacks for which the common groups of horizontal and vertical lamps are provided are shown as arranged in five rows of 20 jacks each, it is obvious that this arrangement may be varied to 10 rows of 10 jacks each, or in fact any desired grouping, so long as the co-ordinate arrangement above described is adhered to.

I have shown but a single panel of a switchboard but it is to be understood that my invention may, with slight modification, be made applicable to multiple switchboards having a plurality of operators' positions.

While I have described my invention in certain particular embodiments, I desire that it be understood that modifications and alterations may be made and that I intend no limitations upon my invention other than those imposed by the scope of the appended claims.

Having described my invention, what I claim is new and desire to secure by United States Letters Patent is:

1. A telephone switchboard comprising a plurality of jacks arranged in intersecting rows, a signal for each horizontal row of jacks, a signal for each vertical row of jacks, means for operating a signal associated with a horizontal row of said jacks and one associated with a vertical row of said jacks to indicate an incoming call, and a busying relay preventing the indication of a second call.

2. A telephone switchboard comprising a plurality of jacks arranged in intersecting rows, a signal for each horizontal row, a signal for each vertical row, means for operating two of said signals to indicate an incoming call, a relay preventing the indication of a second call prior to the answering of the first call and means permitting the indication of the second call after the answering of the first call.

3. A telephone switchboard comprising a plurality of jacks arranged in intersecting rows, a signal aligned with each horizontal row of jacks, a signal aligned with each vertical row of jacks, means for operating two of said signals to indicate an incoming call and means preventing the indication of a second call prior to the answering of the first said call.

4. A telephone switchboard comprising a plurality of jacks arranged in intersecting rows, a signal for each horizontal row and a signal for each vertical row for indicating incoming calls, means preventing the indication of a second call prior to the answering of the first call, and means permitting the indication of said second call subsequent to the answering of said first call.

5. A telephone switchboard comprising a plurality of jacks arranged in intersecting rows, a signal for each horizontal row and a signal for each vertical row for indicating incoming calls, and means for preventing the indication of a second call prior to the answering of the first call.

6. A telephone switchboard comprising a plurality of jacks arranged in intersecting rows, a signal for each horizontal row and a signal for each vertical row for indicating incoming calls, and means for restoring said signals upon the answering of the call.

7. A telephone system including a telephone switchboard, subscribers' lines terminating in said switchboard in jacks arranged in intersecting rows, a signal associated with each of the hori-

zontal rows of said jacks, a signal associated with each of the vertical rows of jacks, means controlled over a subscriber's line for operating a signal associated with each of the rows to indicate a call, and busying means controlling said other signals.

8. A telephone system including a telephone switchboard, subscribers' lines terminating at said switchboard, a jack for each of said subscriber's lines, said jacks being located in a vertical row and a horizontal row, a signal associated with each of the horizontal rows and a signal associated with each of the vertical rows, and means controlled over a subscriber's line for operating the signal associated with the horizontal row and the signal associated with the vertical row in which the jack of the subscriber's line is located to indicate a call, and busying means controlling the other signals.

9. A telephone system including a telephone switchboard, subscribers' lines terminating at said switchboard, a jack for each of said subscriber's lines located in a vertical row and a horizontal row of jacks, a signal associated with each of the horizontal rows and a signal associated with each of the vertical rows, means controlled over a subscriber's line for operating the signal associated with the horizontal row and the signal associated with the vertical row in which the jack of the subscriber's line is located to indicate a call, and means for restoring said signal upon the answering of the call.

10. A telephone system including a telephone switchboard, subscribers' lines terminating at said switchboard, a jack for each of said subscriber's lines located in a vertical row and a horizontal row of jacks, a signal associated with each horizontal row and a signal associated with each vertical row, means controlled over a subscriber's line for operating the signal associated with the horizontal row and the signal associated with the vertical row in which the jack of the subscriber's line is located to indicate a call, and means preventing the indication of a second call prior to the disposition of the first call.

11. A telephone system including a telephone switchboard, subscribers' lines terminating at said switchboard, a jack for each of said subscriber's lines located in a vertical row and a horizontal row of jacks, a signal associated with each of the horizontal rows and a signal associated with each of the vertical rows, means controlled over a subscriber's line for operating the signal associated with the horizontal row and the signal associated with the vertical row in which the jack of the subscriber's line is located to indicate a call, means preventing the indication of a second call prior to the disposition of the first call, and means for restoring said signal upon the answering of the call.

12. A telephone system comprising a plurality of jacks arranged in horizontal and vertical rows, a signal for each vertical row, a relay for each horizontal row, a signal for each horizontal row controlled by said relay, means for operating a signal for a horizontal row and a signal for a vertical row to indicate a call, and means for restoring said operated signals upon the answering of the call.

13. A telephone system including a plurality of jacks arranged in intersecting rows, each jack

being in a horizontal and a vertical row, signals, one for each of said rows, a subscriber's line associated with each of said jacks, means operating the signal associated with the horizontal row and the signal associated with the vertical row in which the jack is located upon the initiation of a call by the line connected to the jack, and busying means for said system.

14. A telephone switchboard including a plurality of jacks connected to subscribers' lines and arranged in horizontal and vertical rows, a signal for each horizontal row, a signal for each vertical row, a relay for each horizontal row, a busying relay, a signal associated with a horizontal row and a signal associated with a vertical row operable to indicate a call.

15. A telephone switchboard including a plurality of jacks connected to subscribers' lines and arranged in horizontal and vertical rows, a signal for each horizontal row, a signal for each vertical row, a relay for each horizontal row, a busying relay, a signal associated with a horizontal row and a signal associated with a vertical row operable to indicate a call, and means controlled by said busying relay for preventing the indication of a second call prior to the disposition of the first call.

16. A telephone switchboard including a plurality of jacks connected to subscribers' lines and arranged in horizontal and vertical rows, a signal for each horizontal row, a signal for each vertical row, a relay for each horizontal row, a signal associated with a horizontal row and a signal associated with a vertical row operable to indicate a call, and means for restoring said signals to normal upon the answering of a call.

17. A telephone switchboard including a plurality of horizontal rows of jacks and a plurality of vertical rows of jacks, a single horizontal row of signals and a single vertical row of signals, each jack being located in a horizontal row and a vertical row, a relay for each horizontal row and a busying relay associated therewith.

18. A telephone switchboard comprising a plurality of jacks arranged in intersecting rows, signals for each of said rows respectively, and means for operating the signals corresponding to the rows in which a jack is located to indicate an incoming call, and means for restoring said operated signals upon the answering of the call.

19. A telephone system including a telephone switchboard, subscribers' lines terminating in said switchboard in jacks, said jacks being arranged in intersecting rows, signals, one associated with each of said rows of jacks, and means actuated upon initiation of a call on one of said lines for displaying the signals associated with the rows in which the jack of said line is located, and means for restoring said operated signals upon the answering of the call.

20. A telephone system including a telephone switchboard, subscribers' lines terminating in said switchboard in jacks, said jacks being arranged in intersecting rows, signals, one associated with each of said rows of jacks, means actuated upon initiation of a call on one of said lines for displaying the signals associated with the rows in which the jack of said lines is located, and means for preventing the display of a second pair of signals prior to the answering of the first call.

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