

May 19, 1953

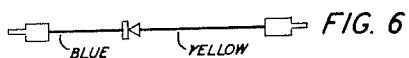
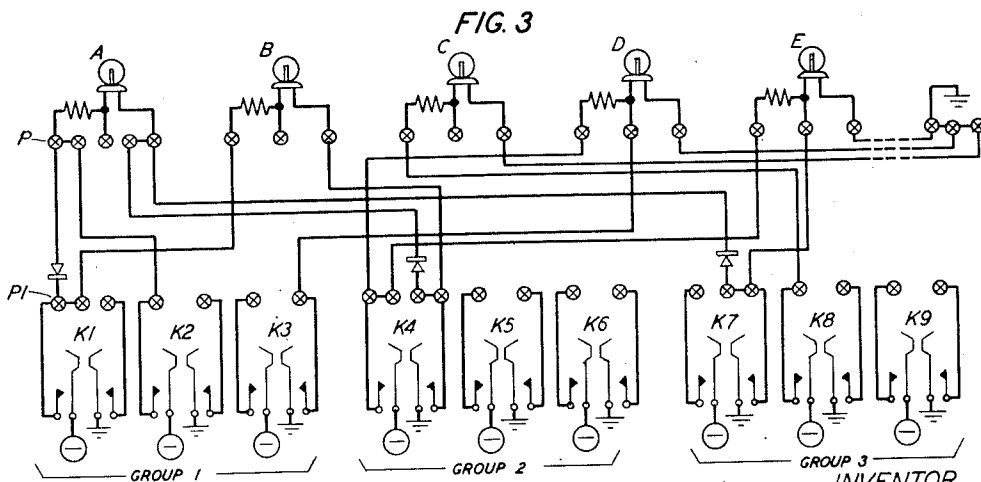
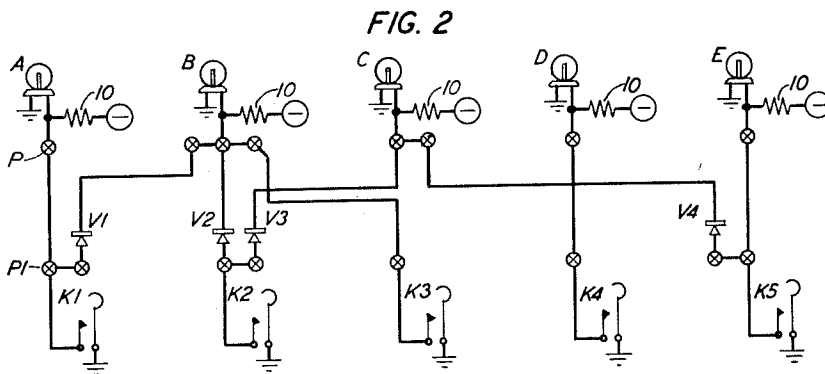
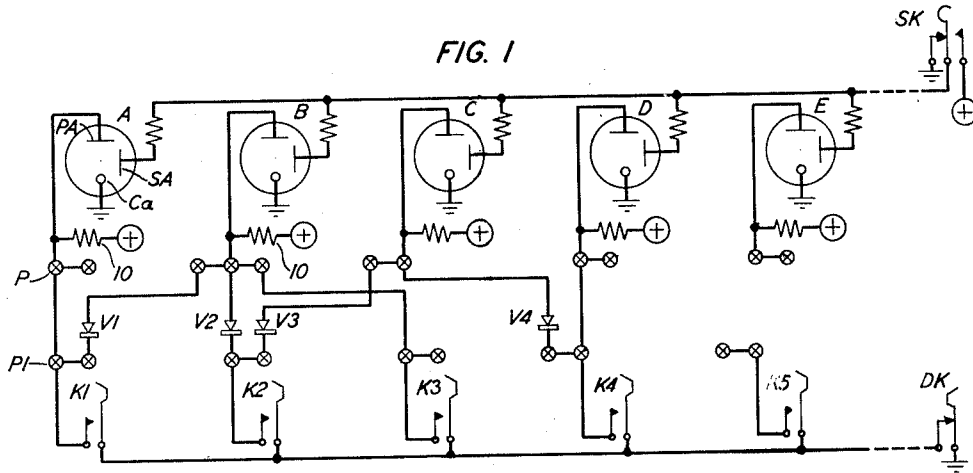
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2,639,415

INDICATOR SELECTING AND LOCK-IN CIRCUIT

Filed Oct. 27, 1948

2 Sheets-Sheet 1



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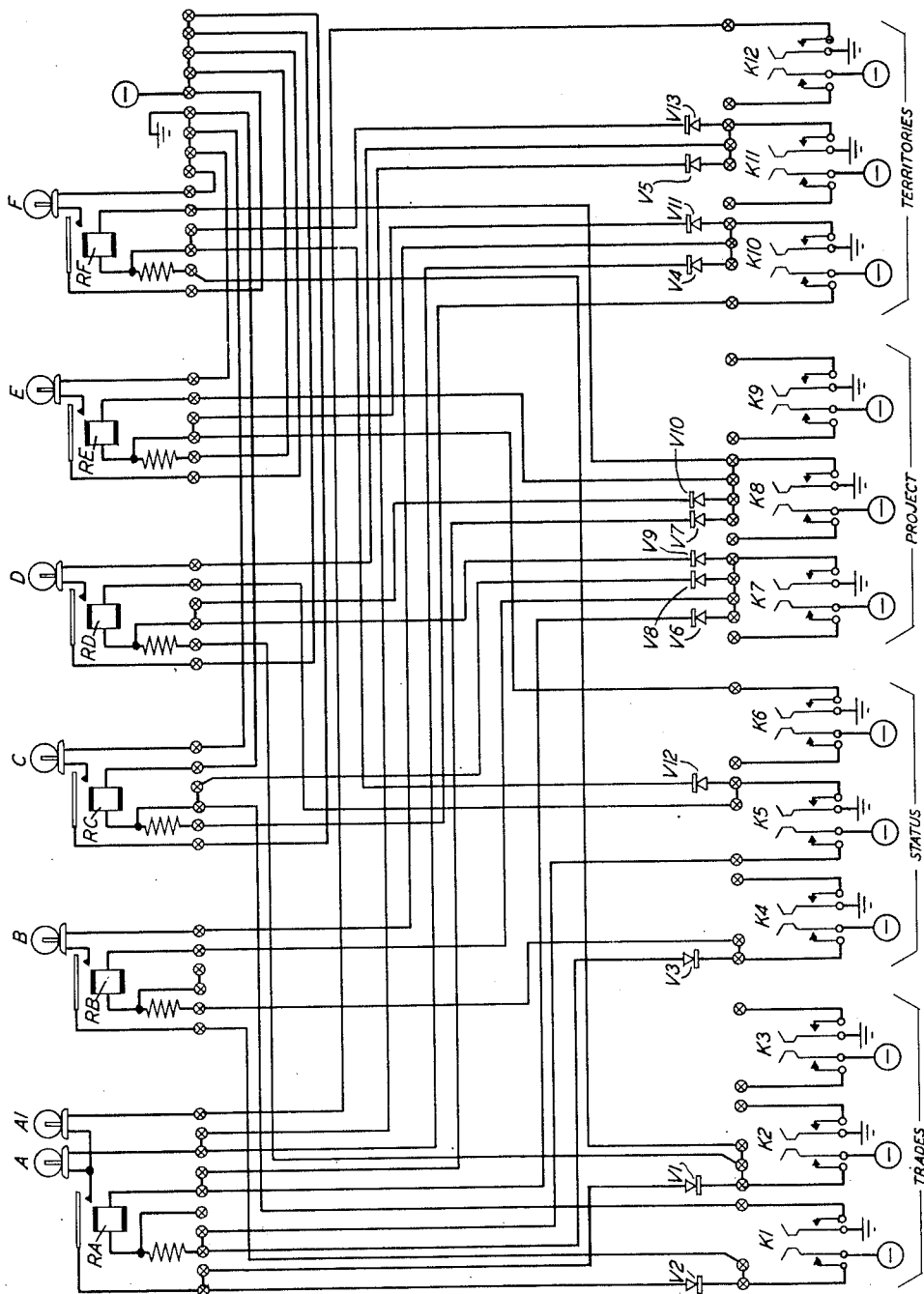
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FIG. 4



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INDICATOR SELECTING AND LOCK-IN
CIRCUIT

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7 Claims. (Cl. 340-147)

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This invention relates generally to selective indicating systems.

More particularly, it relates to systems and methods of indication in which any number from one to less than whole thereof of elements may be variably selected in a non-interfering manner according to code settings of a number of variable elements such as keys or buttons.

A feature of one or more exemplary embodiments of the invention is that settings once made may be maintained as long as desired and thereupon released.

Another feature is that one group or code of settings may be maintained after having been established by the variable members while the variable members are being operated to set up another group or code thereby permitting utilization of indications according to one setting of the variable members while the other members are being operated to prepare indications according to another group of codes.

Other objects are to provide that the same or other groups may be reset as often as desired; that the equipment employed be portable and consist of inexpensive elements; that selections made by operating any key may be readily changed; that consumption of electrical energy be avoided when the arrangement is not in use; and that the equipment be easy to maintain.

Other objects will appear incident to the following description of certain exemplary embodiments of the invention.

Let us assume a specific problem of indicating which of a large number of subscribers desire or should receive certain pieces of information. Specifically, assume an information distributing agency which secures and prepares or compiles information relative to a large number of construction projects. The agency may have an indefinitely large number of subscribers. Just how large is immaterial, but let us assume that the number is five hundred. Many of these subscribers might not wish information with respect to many projects and indeed might not even wish to be bothered with receiving the same, whereas they might wish to receive information with respect to other projects. For example, there might be fifty different classes or varieties of projects and the subscribers might wish to receive information with respect to some selected number only of these; the valuations or commercial importance of projects might be classified, for example, five different ways and certain subscribers might wish to receive some of these classifications but not others; the status or state of

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completion of projects might be classified in a variety of ways and subscribers might wish to receive information from selected ones of these; the trades or materials involved in the projects might be classified in a great variety of manners and subscribers might wish to receive information as to some of these and not others; the territories or regions constituting the loci of the projects might be classified in various ways and subscribers might wish to receive information as to only some of these, and so forth.

Let us assume a manufacturer of bricks was one subscriber. Such manufacturer might perhaps be interested only in building projects employing bricks on a sufficiently large scale to justify shipments of carload lots in a particular restricted territory within one hundred miles of the manufacturer's factory and in which the brick requirements were of some particular type made by the particular subscriber. It would be contemplated that the information agency would prepare brief digests relating to the various projects and that each subscriber would have a box or container for receiving the digest in case it related to something in which he was interested. By employing means in accordance with the invention and setting keys in accordance with coded designations of the digests an indicator individual to each box would be caused to give an indication, as the result of operating selected keys or other operable members located at a keyboard or central point, as to which subscribers would be interested in a particular project. The digests could then be distributed into the boxes as thus indicated and excluded from all the others. The labor-involved sorting process would thus be enormously simplified and the accuracy increased. Thus, in the case given, the simple operation of one key would indicate the exclusion of the digests from the boxes of many subscribers not interested in the particular type of project; thus, for example, the suppliers of lumber would be excluded under control of one or more keys, suppliers of bricks in other territories would be excluded by another or others, suppliers of bricks not interested in delivering directly to the site would be excluded by another or others, and so forth.

In a typical case one operator or attendant would operate or set certain keys in accordance with the indicia on an individual digest and another operator or attendant would distribute copies of that digest in accordance with the indications thus given; while this distribution was taking place the keyboard operator would set up

the keys for the next digest, thus securing overlapping operation. If desired, however, one person could set the keys and make the necessary distribution before resetting the keys for the next digest.

This exemplary instance of utility of the invention should not be taken to exclude the use of apparatus involving the principles thereof for other purposes. Thus, for example, an investment advisory service could have clients classified in various ways. For example, some clients would be interested only in Government bonds, others in municipal bonds, others in railroad bonds, others in particular types of stocks, while many would be interested in various groups of these subjects. Arrangements according to the invention could be used to facilitate distribution of objects or information or various desired subjects in accordance with these classifications. Other possibilities of utility will be apparent.

Certain exemplary embodiments are disclosed in the accompanying drawings wherein:

Fig. 1 represents an arrangement in which cold cathode tubes having starting and transfer electrodes are employed;

Fig. 2 represents an arrangement in which ordinary incandescent light bulbs are employed;

Fig. 3 represents an arrangement in which lamps are lighted by certain combinations of operated keys as well as extinguished thereby;

Fig. 4 is an arrangement in which the combination of relays, lamps and varistors are employed;

Fig. 5 is a diagram of a simple plug-ended cord having both ends equivalent and colored alike; and

Fig. 6 is a diagram of a cord including a rectifier and having its ends designated by different colors, said cords enabling cross-connecting and changes of cross-connections to be expeditiously performed.

In accordance with certain embodiments of the invention indications may be given by operating an element or lighting a light while in others the converse may be the case.

The principal elements of Fig. 1 comprise an indefinite number of cold cathode tubes A, B, C, etc. One tube is intended to identify or designate each of a series of boxes, envelopes, customers or other articles or things. The tubes A, B, C, etc. function circuitly and also as indicating devices. In a practical installation it is contemplated that the number of such tubes would be quite considerable; the illustration of a few only is for the purpose of explaining the principles involved. Other elements are a start key SK, a disconnect key DK, a series of varistors or equivalent rectifying elements V1, V2, V3, V4, etc., and a proper number of code or select keys K1, K2, K3, K4, etc.

The operation to initially set up a coded or selected combination of indications will now be described. The non-locking start key SK is momentarily operated. Each tube A, B, C, etc. has a discharge set up between its cathode Ca and starting anode SA. The discharge is from positive battery over the starting anode to the cathode to ground. The principal anodes PA are connected to positive battery—all keys K1, K2, being open—hence the discharges transfer to the principal anodes, the current path being from positive battery through resistors 10 over the principal anodes PA and cathodes Ca to ground.

The operator or attendant now operates such keys K1, K2, etc. as are called for by the particu-

lar selection to be indicated. The operation of key K1 shorts the principal anode of tube A to ground and tube A is extinguished if and when key K1 is operated. Key K1 also shorts the principal anode of tube B to ground through varistor V1, extinguishing tube B. The operation of key K2 extinguishes tube B through the varistor V2 but would not extinguish tube A (key K1 being unoperated) because the polarity of varistor or rectifier V1 is such as to present a high resistance to current due to positive potential applied through the resistor 10 associated with tube A. Likewise, operation of key K2 extinguishes tube C but does not extinguish tube D. In a similar manner, operation of key K3 extinguishes tube B but does not extinguish tube A. The operation of key K4 extinguishes tubes C and D but does not extinguish tubes A or B. Points P are in multiplied sets for each tube and points P1 are in multiplied sets for each key. By suitable cross-connections of the points P with the points P1 in combinations or codes, any selected tubes can be extinguished and others left lighted by the operation of any code key. Thus, in the case of distributing information relative to building projects, a certain number of tubes might be left operated depending upon which keys are operated, the circuit being arranged so that the operation of one key will usually but not necessarily always extinguish at least one tube and possibly several or many others. Thus, at the end of the operation of a code or selection of keys, the illuminated tubes, which also function as indicators, might indicate subscribers interested in certain specified types of projects involving specified building trades, of a specified status, of a specified range of values, in specified territories, and so forth. The discharge tubes which may be of any suitable type give sufficient illumination to function as indicators; dependent upon whether they are filled with argon, helium, neon, and so forth, the color of the light may be preferably chosen. It is possible within certain limits of design depending upon the construction of the tubes and the ionization voltages of different gases to use tubes filled with different gases or combinations of gases so that some tubes may give off light of one color and others of another color for giving special indicating effects although this is a refinement not essential to the main purposes of the invention.

After the information thus indicated is utilized, key SK may be reoperated, which again initiates discharges in all the discharge tubes, and the operation is repeated.

However, another mode of operation is possible. Thus while the information indicated on one setting is being utilized, the disconnect key may be opened and left opened for a period of time.

With the start key SK positioned normally the discharge tubes which are glowing will continue to glow. In the meantime a new setting of keys K1, K2, K3, K4, etc. may be established but inasmuch as key DK is opened no effect will be produced and upon completion of the utilization of the current setting the operation of the key SK to the right will energize all of the discharge tubes and immediately thereafter closure of key DK will extinguish those which should be extinguished according to the new setting of keys K1, K2, etc., so that a new registration is immediately presented. The information thus indicated may be utilized by the new setting of the code keys. It will be understood that each discharge tube cannot be initially caused to glow by the battery

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voltage applied through its associated resistance 10 unless a discharge is first caused to occur across the starting electrodes from the battery connected to the start key SK. However, after the starting electrodes transfer their discharge to the main electrodes the discharge continues independently of the starting electrodes and key SK may be restored to normal position.

In accordance with the modification as per Fig. 2 ordinary incandescent lamps A, B, C, etc., may be employed. Normally they are all lighted but the operation of any code key will extinguish one or more lamps. Thus, operation of key K1 extinguishes lamp A and also lamp B. It will be noticed that the current from battery supplied over resistors 10 is negative in this case so that for extinguishing the lamp the varistors or rectifiers are directed oppositely to their direction in Fig. 1. The operation of key K2 extinguishes lamps B and C but the rectifier V1 prevents extinction of lamp A and the rectifier V4 prevents the extinction of lamp E because rectifiers V1 and V4 are poled so as to prevent the extinction of lamp A and lamp E, respectively, by key K2. The operation of key K3 can extinguish only lamp B; the operation of key K4 can extinguish only lamp D and the operation of key K5 extinguishes lamps C and E. This arrangement does not permit utilizing one setting while operating the keys to establish a new setting but otherwise has many of the advantages of the arrangement of Fig. 1 and may be particularly useful where cheapness is desired or where one person establishes a selected setting of indications and then utilizes them before going back and establishing a new setting. Every key K1, K2, etc., must be set in its appropriate opened or closed position upon each operation.

The arrangement of Fig. 3 provides means whereby a lamp may be lighted by operation of a code key and some other lamp may be extinguished by the operation of the same key. For this purpose the keys are arranged in groups designated Group 1, Group 2, and Group 3. If key K1 in Group 1 and key K4 in Group 2 are operated battery will be supplied to lamps A and B from key K1 and ground will be supplied to the lamps A and B from key K4 of Group 2 which will cause both lamps A and B to be illuminated. Lamps D and E are also supplied with battery by the operation of key K4 and their right-hand terminals are already connected to ground so that lamps D and E also will be illuminated. If key K2 and key K4 are both operated the lamps A, D and E will be supplied with both battery and ground and will be lighted. The resistor or varistor in the left-hand conductor, directly connecting terminals P and P1 in Fig. 3, prevents the lighting of lamp B because it is so poled as to offer a high resistance to negative current flowing from the battery of key K2 toward the lamp B.

It will be understood that the resistors shown have resistances approximately equal to the resistances of the lamps. Also the resistance of the rectifying elements V1 and V2, etc., which are devices known in the art, is quite considerable in the direction in which they pass little or no current.

Still referring to Fig. 3, if key K4 only is operated it will supply both lamps D and E with battery and since they are permanently connected to ground both lamps D and E will be lighted. If, however, in addition key K1 in Group 3 is operated, a low resistance shunt to ground will be

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placed upon the lamp E and it will be extinguished.

In general, with respect to arrangements embodying the principles of Fig. 3, one key or no keys in each group will be operated to set up a selecting condition but, in general, not more than one key will be operated in any one group. Certain keys are provided with blank contacts and it will be understood that these, along with any other suitable number of groups of keys, may be connected partly or wholly through varistors to other lamps shown or others not shown.

We now come to Fig. 4 which includes in addition to the lamps A, A1, B, etc., relays RA, RB, etc., along with the varistors. The conditions for a lamp being lighted in Fig. 4 are several. In other words, the system is quite flexible. It has several degrees of freedom.

As the first condition for a lamp being lighted it will be noted that all lamps receive battery supply through the armature of a relay and hence the relay armature must be connected through a varistor cord or plain cord to any given key in such a manner that current will flow freely toward the armature. Thus, for example, if key K1 is operated the varistor V2 will freely pass current to the armature of relay RA and current will pass freely to the armature of relay RB through a plain cord with no varistor included.

As to the second condition, the winding of the relay must be supplied with operating battery. Thus, if key K4 or K5 is operated the winding of relay RA will be supplied with battery.

Another condition is that the relay winding must be supplied with ground. Thus, if key K7 is operated the winding of relay RA will be supplied with ground through varistor V6 in a direction to freely pass current and likewise through the varistor V7 if key K8 were operated.

Another condition necessary for the lighting of a lamp is that its associated relay does not have a shunt around the winding. Thus, with the connections shown the relay RC has a permanent shunt upon its winding if either of keys K1 or K7 is operated and the relay RD will have a shunt thereon through the varistor V9 or V10 if key K7 or key K8, respectively, were operated.

Another condition necessary for the lamps to be lighted is that the ground side of their circuits is supplied with ground. Thus, in the case of lamp A it would be supplied with ground through varistor V4 if key K10 were operated and through varistor V5 if key K11 were operated. In the case of lamp A1 it would be supplied with ground if key K12 were operated, the connection being through a plain cord having no varistor. In the case of lamp F it has a permanent ground connected thereto in the arrangement shown.

In view of this explanation the further operation of Fig. 4 may be illustrated by means of tables. Thus, we may set down at the head of the table the combination of keys to be operated which may consist of one or none but usually not more in each group; the various groups, in accordance with the use of the system being employed for selecting business projects, various trades, the various statuses, the various projects, the various territories, and so forth. Having identified the keys to be operated, we may set down in the table which relays have battery supplied to their armatures, which relay windings are supplied with battery, which relay windings are supplied with ground, which relay windings are shunted, and thus we may set down which relays are operated, and we may also set down which

lamps are supplied with ground and from this information we may set down which lamps are lighted.

By way of illustration we will now assume that keys K1, K4, K7 and K10 are operated which results in the following table:

Keys operated: K1, K4, K7, K10

Relays with Battery Applied to Armature	Relay Windings Supplied with Battery	Relay Windings Supplied with Ground	Relays Shunted	Relays Operated	Lamps Supplied with Ground	Lamps Lighted
RA RB RC RD RE RF	RA RB RC RE	RA RB RC	 RC RD RE	RA RB	A B C E F	A B

In accordance with this setting of keys only the lamps A and G give lighted indications which could indicate that only two subscribers designated by A and B would desire a particular piece of information.

In a similar manner we may assume that keys K2, K5, K7 and K12 are operated which results in the following table:

Key operated: K2, K5, K7, K12

Relays with Battery Applied to Armature	Relay Windings Supplied with Battery	Relay Windings Supplied with Ground	Relays Shunted	Relays Operated	Lamps Supplied with Ground	Lamps Lighted
RA RC RD RE RF	RA RD RE RF	RA RB RC RD	 RC RD	RA	A1 C E F	A1

Thus, by suitable selection of keys representing trades, statuses, projects and territories we at once note the indication that only one subscriber, who is designated by the lamp A1, would be interested in receiving certain types of information.

An important consideration connected with the use of this invention is the ease with which connections may be changed so that, whereas before the change the operation of a given key does not light a light, it will light it after the change, or vice versa.

Also, an arrangement of this kind, to be adaptable to changing conditions, must obviously be readily adaptable to changes of indications, both as respects the number of indications and the requirements therefor. To this end each lamp, relay and key terminal is, in general, provided with a number of jacks in multiple. With reference to Fig. 1, these terminals are designated P and P1 and all connections between points P and P1 are made by means of cords. In a similar manner it will be understood that connections are made in the case of Figs. 2, 3 and 4 with each point P and each point P1 consisting of an adequate number of jacks which are multiplied together. This brings us to a discussion of the manner in which changes in interconnections and codings may be made. For this purpose two types of cords having plug ends are furnished, one of these types being according to Fig. 5 which is a plain cord and the other according to Fig. 6 which is a cord containing a varistor or rectifying element. The manner of using these cords and their purposes will now be further outlined.

For relay establishment of connections each terminal at a key which is to be connected to battery or ground has a definite color and each terminal (in the case of Fig. 4) of a relay winding, relay armature or lamp which is to be connected to battery or ground has a definite color.

In the case of other arrangements, such as Figs. 1, 2 and 3 the relay armatures and windings are not present but the same considerations apply to the other terminals. As stated, there are two kinds of cords, plain cords and those containing varistors or rectifying elements. The plain cord has a color different than the color of any terminal, for example, green, as per Fig. 5. The

cord containing the varistor has terminals with two distinctive colors, for example, blue and yellow, as per Fig. 6. The varistor is arranged in each cord so that conductivity of positive current is always from one color to the other, for example, from yellow to blue. With the color examples stated the terminals connectable to ground by keys are yellow, terminals connectable to battery by keys are blue, terminals of lamps and relays to which ground is to be connected are blue, and terminals of lamps and relays to which battery is to be connected are yellow. This enables the cross-connection to be changed by relatively unskilled personnel because it minimizes the possibility of improper connections. In cross-connecting yellow terminals of cords are always connected to yellow fixed terminals and blue terminals of cords are always connected to blue fixed terminals.

What is claimed is:
1. In combination, a series of circuit closers, a series of indicators, plurality of said circuit closers having connected to them a plurality of multiplied terminals forming a first series, a plurality of said indicators having connected to them a plurality of multiplied terminals forming a second series, plain conductive cords connected between certain terminals of said first and second series, conductive cords including rectifiers connected between terminals of said first and second series poled toward said first series, and other conductive cords including rectifiers connected between terminals of said first and second series poled toward said second series, terminals

of certain of said cords being connected to the same multiplied group.

2. A combination according to claim 1 wherein said indicators are gas-filled tubes of the type having a primary or start discharge path and a principal discharge path, said cords being pre-selectable elements for selectively preparing disabling paths for certain of said tubes, in combination with for energizing all said start discharge paths, means normally conditioned to tend to transfer each discharge to its associated principal discharge path, a disconnect switch and means operative upon closure of which, all said prepared disabling paths are rendered effective to extinguish tubes selectively as preselected.

3. In combination a plurality of keys, each of which when operated supplying ground and battery, a plurality of relays having individual windings, connections whereby each relay closes a path capable of connection to supply battery to an indicator, connections whereby operation of selected of said keys supply battery to selected of said armatures, connections whereby operation of selected of said keys supply battery to selected of said windings, connections whereby operation of selected of said keys supply ground to selected of said windings, connections whereby operation of selected of said keys supply releasing shunt paths to selected of said relays, and connections whereby operation of certain of said keys supply ground paths to selected of said indicators, said selections being independent and certain of said connections including rectifiers.

4. In combination, a series of indicators, a supply battery, a series of keys, means whereby certain of said keys, when operated, connect battery to selected of said indicators, means whereby certain of said keys, when operated, supply operating grounds to selected of said indicators, means whereby certain of said keys, when operated, supply operating inhibiting grounds to selected of said indicators, and means whereby said selections are made independent.

5. In combination, a series of indicators, a supply battery, a series of keys, means whereby certain of said keys, when operated, connect battery to selected of said indicators, means whereby certain of said keys, when operated, supply operating grounds to selected of said indicators, means whereby certain of said keys, when operated, supply operation inhibiting grounds to selected of said indicators, means whereby said selections are independent of one another, said first mentioned means including rectifiers some of which are poled toward said supply battery and some of which are poled away from said supply battery.

6. In an indicating system, a first plurality of groups of jacks, a second plurality of groups of jacks, a plurality of lamps, each of said lamps connected to a jack in one group of jacks of said first plurality of groups of jacks, a plurality of keys, each of said keys connected to a jack in one group of jacks of said second plurality of

groups of jacks, a first plurality of plug-ended flexible cords connecting certain of said jacks in said first plurality of groups of jacks with certain of said jacks in said second plurality of groups of jacks, a second plurality of plug-ended flexible cords having a rectifier therein and connecting others of said jacks in said first plurality of groups of jacks with others of said jacks in said second plurality of groups of jacks, certain of said jacks in said first and second plurality of groups of jacks being multiply connected, so as to control combinations of said lamps as desired in response to the actuation of combinations of said keys.

7. In an indicating system, a first plurality of groups of jacks, a second plurality of groups of jacks, a plurality of gaseous discharge tubes each having a main anode, a control anode and a cathode, each of said main anodes being connected to a jack in one group of jacks of said first plurality of groups of jacks, means including a start key for applying positive potential instead of ground potential to said control anodes, means for applying positive potential to each of said main anodes through a resistor, said cathodes being grounded, a plurality of keys, each of said keys connected to a jack in one group of jacks of said second plurality of groups of jacks, a first plurality of plug-ended flexible cords connecting certain of said jacks in said first plurality of groups of jacks with certain of said jacks in said second plurality of groups of jacks, a second plurality of plug-ended flexible cords having a rectifier therein and connecting others of said jacks in said first plurality of groups of jacks with others of said jacks in said second plurality of groups of jacks, certain of said jacks in said first and second plurality of groups of jacks being multiply connected so as to control combinations of said tubes as desired in response to the actuation of combinations of said keys, the shunting of undesired anodes being prevented by the high resistance in the reverse direction of said rectifiers.

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