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2,918,608

SELECTIVE GROUP ENERGIZING SYSTEM

Filed June 25, 1956

2 Sheets-Sheet 1

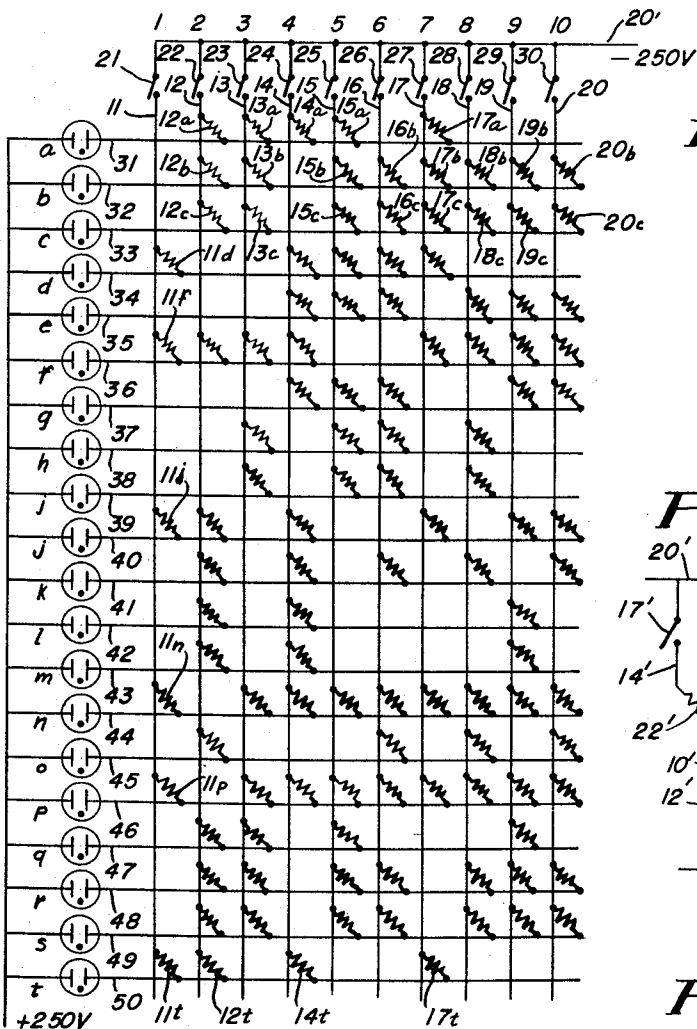


Fig. 2.

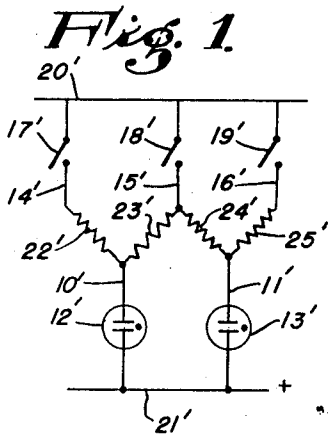


Fig. 1.

Fig. 4.

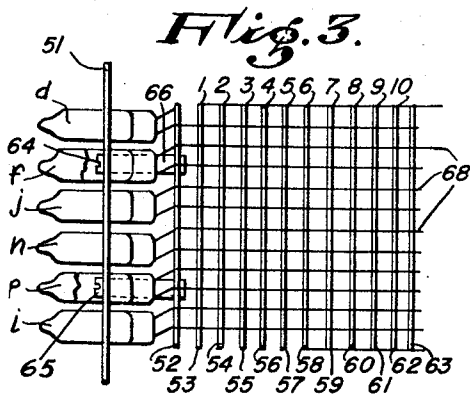
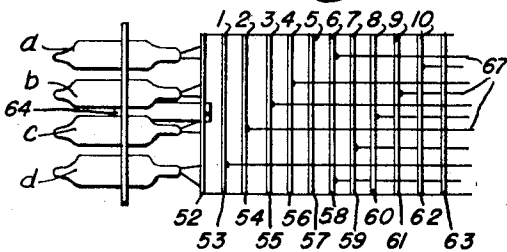


Fig. 3.



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2 Sheets-Sheet 2

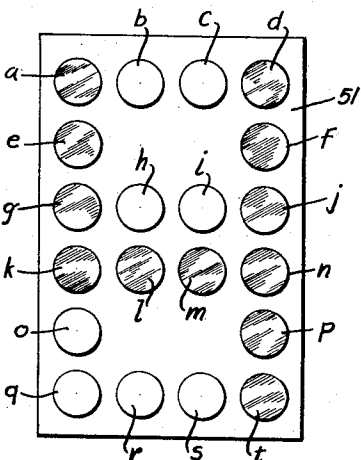


Fig. 5.

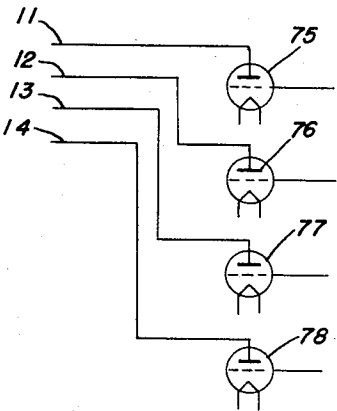


Fig. 8.

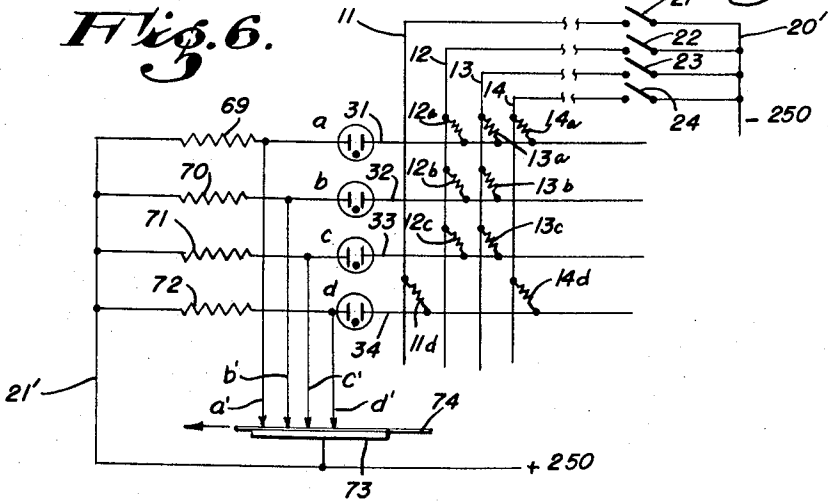


Fig. 6.

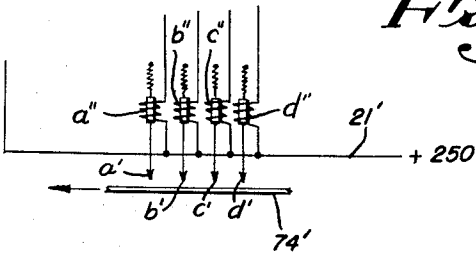


Fig. 7.

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1

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SELECTIVE GROUP ENERGIZING SYSTEM

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4 Claims. (Cl. 315—166)

The present invention relates generally to a selective group energizing system, wherein a plurality of electrically operable devices may be selectively energized in predetermined discriminating groups or combinations.

Heretofore group switching has in the main been accomplished by the utilization of drum controllers, multi-contact circuit breakers, and the like which necessitated complex switching of the devices into the desired groups or combinations. Such arrangements were not susceptible of rapid operation, are bulky and cumbersome, contain moving parts which present a maintenance problem and possible failure, and in general are not inherently adapted for many applications, where smallness of size and dependability become a vital factor.

Having the foregoing in mind, it is a broad concept of the present invention to provide a selective group energizing system of the above character in which the devices are permanently connected in the desired groups in a network, and wherein group energization may be accomplished through energizing of a single conductor for each group.

It is a further object to incorporate such a system into a simple, compact structure wherein the electrically responsive devices and network group energizing circuits are physically arranged in a unique unit of small size having single terminal connections for the respective group controls.

Still another object is to provide a system of the herein described type which is susceptible of general application, and wherein single contact control for energization of each group permits control from the output of a radio tube or transistor, in which the operation of the devices may be such as to produce, for example, visual, printed or otherwise formed characters at a distance or remote station in response to locally produced pulses or circuit controllers at a local station. Such applications might take the form of score boards, computers, impulse counters, mechanical counters, remote printers and typewriters, etc., and in industrial applications finds use in automatic group control of operations and processes.

Further objects of the invention will be brought out in the following part of the specification, wherein detailed description is for the purpose of fully disclosing the invention without placing limitations thereon.

Referring to the accompanying drawings, which are for illustrative purposes only:

Fig. 1 is a view of a simplified network schematically illustrating the basic concept of my invention;

Fig. 2 is a schematic arrangement of a network for a visual indicating device embodying the features of the present invention;

Fig. 3 is a side elevational view of a unit embodying the system disclosed in Fig. 2;

Fig. 4 is a plan view of the same;

Fig. 5 is a front elevational view of the same, showing the arrangement of visual indicating devices therein;

Fig. 6 is a view schematically illustrating a modified

2

form of the invention, wherein remote indicating and permanent recording means are controlled;

Fig. 7 is still another modification diagrammatically illustrating the invention as embodied in a remote printer; and

Fig. 8 is a view diagrammatically illustrating the invention as being controlled by means of an electronic device.

Referring now to the drawings, for illustrative purposes only, there is shown in Fig. 1 a simplified arrangement of a system for selectively energizing groups of electrical devices according to the present invention.

More specifically, the simplified arrangement is disclosed as including a plurality of circuits, which are to be controlled, as represented by the numerals 10' and 11'. These circuits respectively contain gas diodes, shown as consisting of neon lamps 12' and 13'. A plurality of control circuits 14', 15' and 16' are provided, each of these control circuits being respectively connected through control switches 17', 18' and 19' with a conductor 20' which forms one side of an electrical source of potential, while the neon lamps 12' and 13' have one terminal which is connected with conductor 21' which forms the other side of the potential source.

In the simplified arrangement, the control circuits are connected with the circuits which are to be controlled, through resistors, depending upon the manner in which it is desired to control the neon lamps by actuation of the control switches of the control circuits. For illustrative purposes, the control circuit 14' is connected with circuit 10' through a resistor 22'. The control circuit 15' is connected through a resistor 23' to the circuit 10', and through a resistor 24' with the circuit 11'. Circuit 16' is connected with circuit 11' through resistor 25'. The value of these resistors may vary, however, in the present instance resistors of approximately one megohm value have been utilized.

With the system as illustrated in Fig. 1, the lamps 12' and 13' may be selectively controlled, as will now be explained. Let it be assumed that it is desired to energize the lamp 12'. This is accomplished by closing the switch 17', whereupon a primary circuit is established through 14', resistor 22', circuit 10' and lamp 12'. Neon lamps have a striking voltage of approximately 70 volts, and until the lamp fires, there will be substantially no current flow to the lamp. After firing, the voltage drop across the lamp is approximately constant and therefore the series resistor, resistor 22', in this case acts as a limiting resistor to prevent the lamp from being damaged due to high current that could flow through the lamp. As the voltage is increased, providing lamp 12' has a lower striking voltage than lamp 13', lamp 12' will light and in this case give a visual indication. It will be readily appreciated that this visual indication may be utilized in the formation of characters by group energization of a plurality of lamps, as will hereafter be explained, or advantage may be taken of the flow of current through the lamp to operate other devices in a manner which will hereafter be explained more fully.

In the above example, under ordinary circumstances, a circuit will also be established from the circuit 14' through resistors 23' and 24', and thence through circuit 11' and lamp 13'. However, in this case the resistors 23' and 24' will act to reduce the voltage applied to lamp 13', so that under ordinary circumstances the lamp 13' will not light. However, the situation might arise, wherein the lamp 13' would have a lower striking voltage than the lamp 12', and that the resistors 23' and 24' would not reduce the voltage sufficiently to prevent the lamp 13' from lighting prior to lamp 12'. However, under such circumstances as the voltage applied to lamp 12' is raised sufficiently to reach a striking point, the

3

lamp 12' will light, and upon so doing, the lamp 13' will be extinguished due to the fact that the voltage across lamp 12' is at this time too low to maintain the striking voltage of lamp 13'. Thus under some conditions, the lamp 13' might be lighted for an instant.

The lamps 12' and 13' are shown as being connected for group operation by actuation of the switch 18'. Thus, closure of switch 18' will energize each of the lamps 12' and 13' through a single resistor, namely resistor 23' and resistor 24' respectively.

To control the lamp 13', this may be accomplished by actuation of the switch 19', whereupon the primary energizing circuit for the lamp will be through resistor 25'. The same situation may occur in this case as previously described, wherein the lamp 12' may momentarily be energized through resistors 23' and 24'. It will therefore be seen that the lamps, which are connected for actuation by the closure of a single control switch, are energized in each case through a single resistor, while backfeed to the other lamps will be through at least two resistors which will act to prevent energization of the unwanted lamps.

Referring now to Figs. 2, the basic principles of my invention are shown as being embodied in a selective group energizing system wherein single switching devices are utilized for group energization of the lamps, the lamp groups being so arranged that upon energization they form discreet characters, in this case visually representative of the numerals from 1 to 10.

For the above purpose, the lamps are shown in Fig. 5 as being arranged upon a supporting panel 51, the lamps being indicated by the letters *a* to *t* inclusive and being arranged in the general configuration of a figure 8 as conventionally utilized in electric signs for the successive display of numerals by group energization of the lamps. While the lamps have been illustrated as arranged for the display of numerals, it is to be understood that lamp banks may be arranged for the display of other characters such as letters, etc., and that the fundamental concepts of my invention may be utilized to control the group energization of such lamps in the same manner as described for numerals.

Referring again to Fig. 2, the electric group energizing system is in this embodiment arranged in a network made up of "first" conductors which are successively indicated by numerals 11 to 20 inclusive, and which constitute single control lines such as those previously indicated at 14' in Fig. 1, the control lines being connected through switches 21 to 30 respectively to the conductor 20' forming one side of an electrical source of potential. The switches 21 to 30 inclusive permit individual energization of the lines 11 to 20, respectively, and these switches have further been identified together with their associated lines with indicia successively numbering from 1 to 10. Thus, when the switch 24 corresponding to the indicia "4" is closed, lamps *a*, *d*, *e*, *f*, *g*, *j*, *k*, *l*, *m*, *n*, *p* and *t* on the panel 51 will be energized to form the numeral "4" as indicated by the shaded lamps in Fig. 5. The same is true for the other indicating indicia "1 to 10" inclusive.

The lamps *a* to *t* inclusive have one of their terminals connected with the common conductor 21' forming the other side of the electrical potential source. The other terminals of these lamps are respectively connected to "second" conductors 31 to 50 inclusive. The selective grouping of the lamps to be controlled by the respective switches 21 to 30 inclusive, so as to properly form the required visual indicia, when energized, is accomplished by connecting each first conductor to each of its group lamps through a resistor of appropriate value. The conductor 11 is connected to the respective conductors 34, 36, 40, 44, 46 and 50 through resistors 11*d*, 11*f*, 11*j*, 11*m*, 11*p* and 11*t* respectively; conductor 12 connected to conductors 31, 32, 33, 36, 40, 41, 42, 43, 45, 47, 48, 49 and 50 through resistors 12*a*, 12*b*, 12*c*, 12*f*, 12*j*, 12*k*,

4

12*l*, 12*m*, 12*o*, 12*q*, 12*r*, 12*s*, and 12*t* respectively; conductor 13 being connected to conductors 31, 32, 33, 36, 38, 39, 44, 46, 47, 48 and 49 through resistors 13*a*, 13*b*, 13*c*, 13*f*, 13*h*, 13*i*, 13*n*, 13*p*, 13*q*, 13*r* and 13*s*; conductor 14 being connected with conductors 31, 34, 35, 36, 37, 40, 41, 42, 43, 44, 46 and 50 through resistors 14*a*, 14*d*, 14*e*, 14*f*, 14*g*, 14*j*, 14*k*, 14*l*, 14*m*, 14*n*, 14*p* and 14*t* respectively; conductor 15 being connected to conductors 31, 32, 33, 34, 35, 37, 38, 39, 44, 46, 47, 48 and 49 through resistors 15*a*, 15*b*, 15*c*, 15*d*, 15*e*, 15*g*, 15*h*, 15*i*, 15*n*, 15*p*, 15*q*, 15*r*, 15*s*, respectively; conductor 16 being connected to conductors 32, 33, 34, 35, 37, 38, 39, 41, 44, 45, 46, 48 and 49 through resistors 16*b*, 16*c*, 16*d*, 16*e*, 16*g*, 16*h*, 16*i*, 16*k*, 16*n*, 16*o*, 16*p*, 16*r* and 16*s*, respectively; conductor 17 being connected to conductors 31, 32, 33, 34, 36, 40, 44, 46 and 50 through resistors 17*a*, 17*b*, 17*c*, 17*d*, 17*f*, 17*j*, 17*n*, 17*p* and 17*t*, respectively; conductor 18 being connected to conductors 32, 33, 35, 36, 38, 39, 41, 44, 45, 46, 48 and 49 through resistors 18*b*, 18*c*, 18*e*, 18*f*, 18*h*, 18*i*, 18*k*, 18*n*, 18*o*, 18*p*, 18*r*, 18*s*, respectively; conductor 19 being connected to conductors 32, 33, 35, 36, 37, 40, 42, 43, 44, 46, 47, 48 and 49 through resistors 19*b*, 19*c*, 19*e*, 19*f*, 19*g*, 19*j*, 19*l*, 19*m*, 19*n*, 19*p*, 19*q*, 19*r* and 19*s*, respectively; and conductor 20 is connected to conductors 32, 33, 35, 36, 37, 40, 41, 44, 45, 46, 48 and 49 through resistors 20*b*, 20*c*, 20*e*, 20*f*, 20*g*, 20*j*, 20*k*, 20*n*, 20*o*, 20*p*, 20*r* and 20*s*, respectively.

From the above, it will be apparent that the first conductor feeds each lamp of its connected group through a primary circuit containing one resistor, whereas backfeed from a first conductor to a lamp in a group connected to another first conductor will be through at least two of the resistors, as explained in the network disclosed in Fig. 1. The resistors therefore operate to discriminate in the selection of similar lamps for the different groupings.

The network system as disclosed in Fig. 2 is embodied in a unique compact unit structure as shown in detail in Figs. 3 and 4. As shown, the panel 51, containing the lamps *a* to *t*, inclusive, and arranged as shown in Fig. 5 is assembled permanently with a plurality of panels 52 to 63 inclusive which are arranged rearwardly of the panel 51 and occupy relative parallel positions with respect to each other. Panel 52 is permanently supported rearwardly of panel 51 by means of a pair of securing bolts 64 and 65, each of these bolts being associated with a tubular spacer 66 which determines the interval between the panels 51 and 52. The panels 53 to 62 inclusive correspond with the respective numeral indicia as represented by the first conductors 11 to 20 inclusive, and each of these panels contain the first conductor together with the respective resistors which connect the first conductor with the second conductors to feed the specific group associated with the first conductor. Each of the panels embodies the conductors and component resistors either as separate components or in printed circuit arrangements. The last panel 63 constitutes a terminal panel to which terminal connections are brought out respectively by terminal wires 67 from the panels 53 to 62 inclusive, while wires as indicated at 68 are carried along the side edges of the panels and form connections from the respective panel circuits to the lamps. The connection wires 67 and 68 pass through edge notches in the panels and thus constitute a holding means for the intermediate panels. The physical arrangement of the circuits and lamps, as shown in Fig. 3 and 4, thus constitutes a compact assembly which makes the system practical for commercial applications and eliminates the large complex switching arrangements utilizing drum controllers, etc., as heretofore utilized.

The system as described above constitutes a visual indicating arrangement whereby the visual indicating devices in the form of neon lamps may be group energized to indicate visually discernible characters in the form of numerals. It will be appreciated that the lamps may

be located at a remote point, while the control switches for selecting the groups may be placed at a local station. The basic concept is readily adaptable, however, for obtaining other types of indications and recordings, and as exemplary of such an adaptation, there is shown in Fig. 6 an arrangement whereby a permanent record may be obtained. In this modification, resistors are connected in series with the diodes or neon lamps. For example, such resistors as indicated by the numerals 69, 70, 71 and 72 have been shown in series with the lamps *a*, *b*, *c*, and *d* respectively, and similar resistors would be connected in series with the other lamps. These resistors, when the associated lamp in circuit therewith fires, form a source of potential which may be utilized for the actuation of other devices. For example, these potentials may be utilized for producing a written record at a distance. This may be done in several ways. As shown, the conductor 21', which forms a common connection to one terminal of the resistors may be connected to an electrode in the form of a plate member 73 which is adapted to have a special voltage sensitive paper strip 74 moved thereover. On the other side of the strip 74, there are provided a plurality of styluses as indicated at *a'*, *b'*, *c'*, *d'*, corresponding to the neon lamps *a*, *b*, *c*, *d*, etc., and arranged in the same geometrical figure as shown in Fig. 5. These styluses are respectively connected to the opposite terminals of the resistors 69, 70, 71 and 72 so that when a voltage appears across the resistor, a potential similarly appears between the stylus and the electrode 73 having the paper strip 74 therebetween. This voltage will produce a chemical change in the paper strip and thus give a permanent written record of each character formed by the respective groups as they are successively energized. It is to be understood, of course, that during the time the styluses are energized, relative movement will be terminated between the styluses and the strip 74 by means known to those skilled in the art, and deemed unnecessary to show herein. A number of papers have been commercially developed which are suitable for use as just explained. One type is commercially available under the trade name "Teledos." This type of paper constitutes a dry method of reproduction. Additionally, there are other papers which may be used in a wet process printing wherein the paper is subjected to a solution of phenolphthalein and potassium chloride. Another way in which the potentials across the resistors may be utilized is shown in Fig. 7. In this arrangement, the voltages are utilized to actuate solenoids, *a''*, *b''*, *c''*, *d''* which serve to mechanically press the styluses against a suitable paper such as a carbon paper 74' and thus by exerting mechanical pressure form a permanent record on the moveable strip during periods of nonmovement of the strip relative to the styluses.

As thus far described, the group selection controls have comprised the mechanically manually operable switches 21 to 30 inclusive. It will be appreciated, however, that if desired, these switches may be automatically actuated in timed sequence if such operation is called for. Also, since the control and selection of various groups is accomplished through the closing of a single pair of contacts, the system is readily adapted to be controlled by means of electron devices such as vacuum tubes and transistors. As shown in Fig. 8, the first conductors 11, 12, 13, 14, etc., may be respectively connected in the plate circuits of control vacuum tubes 75, 76, 77, 78, etc., thus enabling the invention to be utilized under many and varied applications.

Various modifications may suggest themselves to those skilled in the art without departing from the spirit of my invention, and, hence, I do not wish to be restricted to the specific form or forms shown or the uses

mentioned, except to the extent indicated in the appended claims.

I claim:

1. A selective group energizing system, comprising: an electric source; a plurality of first conductors; means for selectively connecting each of said first conductors with one side of said electric source; a plurality of electrically energizable devices, each having a pair of connection terminals, one terminal of each of said devices being connected with the other side of said electric source; a plurality of second conductors respectively connected with the other terminals of said devices; and resistors interconnected between each of said first conductors and those second conductors having connection with such of said devices as may be required to be energized as a group, when the connected first conductor is energized.

2. A network control system, comprising: a plurality of electrically energizable devices adapted to be permanently connected into discrete groups; a plurality of selectable group control wires, each of said wires determining the operation of a specific group of said devices connected thereto; and means connecting the electrical devices with said control wires including resistor elements cooperable to energizingly discriminate between those of said devices which are contained in a group connected with a selected wire, and those devices contained in a group connected with a nonselected wire.

3. A selective group energizing system, comprising: an electric source; a plurality of first conductors; means for selectively connecting each of said first conductors with one side of said electric source; a plurality of electrically energizable neon lamps, each having a pair of connection terminals, one terminal of each of said lamps being connected with the other side of said electric source; a plurality of second conductors respectively connected with the other terminals of said lamps; and resistors connecting each of said second conductors with more than one of said first conductors, whereby the group of lamps connected with one of said first conductors, upon its being energized, will fire and establish low impedance circuits therethrough which prevent firing of other lamps connected to a non-selected first conductor.

4. A selective group energizing system, comprising: an electric source; a plurality of first conductors; means for selectively connecting each of said first conductors with one side of said electric source; a plurality of electrically energizable neon lamps, each having a pair of connection terminals, one terminal of each of said lamps being connected with the other side of said electric source; a plurality of second conductors respectively connected with the other terminals of said lamps; and resistors connecting each of said second conductors with more than one of said first conductors, said resistors and said neon lamps, which are connected to a selected first conductor coacting to switchingly determine and simultaneously provide group indication, upon completing the circuit through said selected first conductor.

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