May 30, 1933. H. B. MARSH 1,911,911

SYSTEM OF ILLUMINATION

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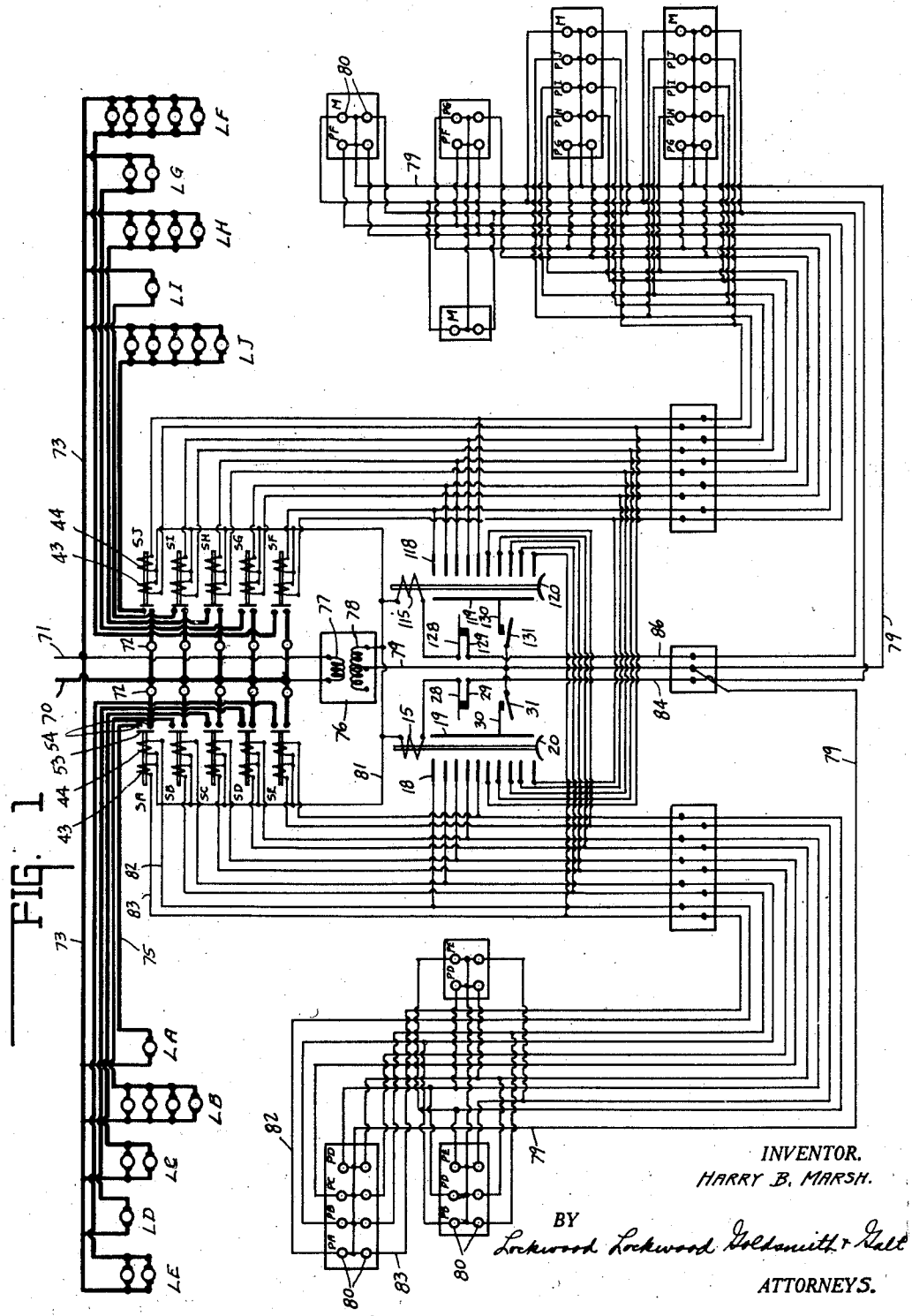


FIG. 1

INVENTOR.
HARRY B. MARSH.

BY Lockwood Lockwood Goldsmith & Galt

ATTORNEYS.

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FIG. 2

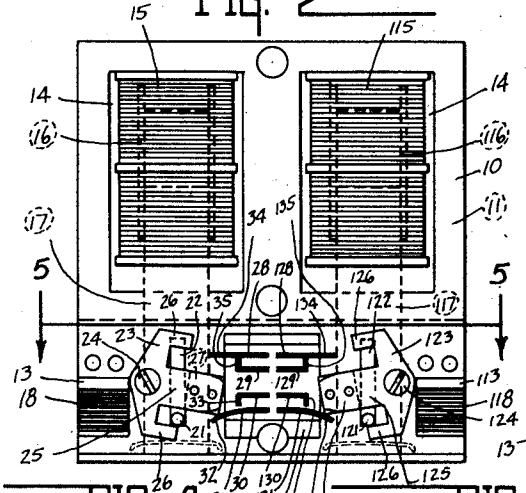


FIG. 3

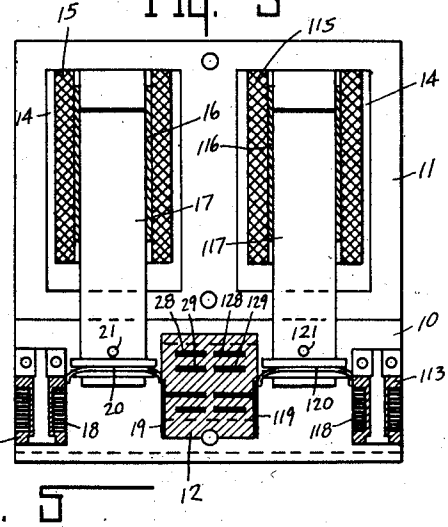


FIG. 4

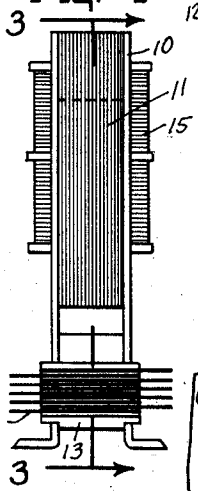


FIG. 5

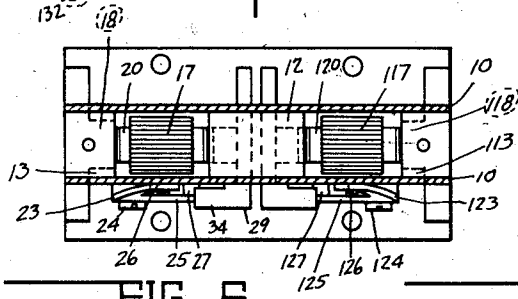


FIG. 6

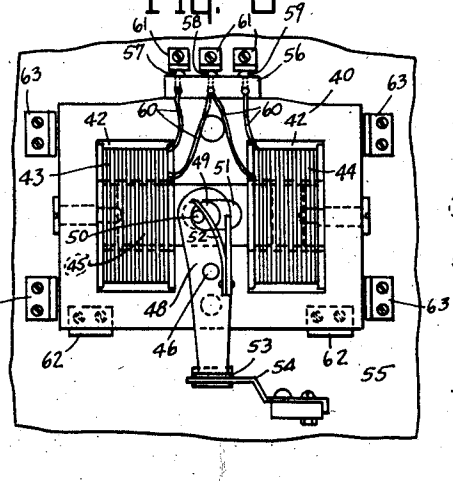
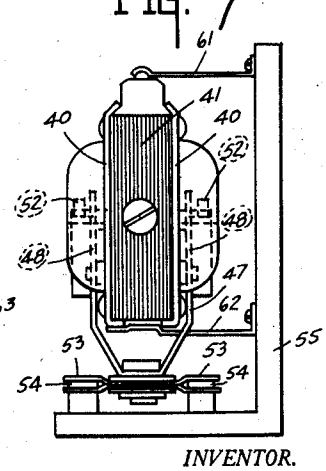


FIG. 7



INVENTOR.
HARRY B. MARSH.

BY
Lockwood Lockwood Goldsmith & Galt

ATTORNEYS.

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UNITED STATES PATENT OFFICE

HARRY B. MARSH, OF INDIANAPOLIS, INDIANA

SYSTEM OF ILLUMINATION

Application filed November 1, 1929. Serial No. 404,190.

This invention relates to a control system for the illumination of buildings and the like.

The principal object of the invention is to provide, with a minimum cost for wiring and apparatus, a system wherein certain lamps or groups of lamps may be controlled from a large number of separate stations.

One feature of the invention consists in the provision of magnetic switches for the control of the lighting circuits, the said switches being in turn controlled by low voltage circuits operated from manual switching stations. By this means the large wires necessary for carrying the lighting current need be run only between the lamps and a main control cabinet. Heretofore it has been necessary to loop each set of lighting wire to the switch or switches which normally control the circuits through said wires. If a large number of switch stations are provided, the lighting wires and the conduits therefor become an extremely expensive portion of the installation.

By the provision of low voltage circuits for connecting the manual switching stations to the main control cabinet, a much smaller and cheaper size of wire may be used and, in many cases, the use of conduit for these wires may be dispensed with. This low voltage type of wiring is classed by the Underwriters Laboratories, Inc. as a signalling system and not as a lighting or power circuit. Therefore, less expensive equipment may be employed and a large number of push button stations for each group of lamps may be economically used. Because of the low voltage and low current required, each push button station need be only about one-sixth as large as that customarily employed for house lighting.

Another feature of the invention consists in the provision of a single master switch which may be operated from individual master push button stations placed in convenient locations about the building. Certain groups of lamps or all of the lamps in the building may be controlled from the said master switch. The master switch acts through the magnetic switches heretofore mentioned in the same manner as the push button stations and, therefore, carries a small current at low voltage and may be lightly and cheaply constructed. The master switch is in itself a magnetic switch operating upon a low voltage. The master push buttons operating the master switch are, therefore, of the same low voltage type as used for the individual illumination groups.

Another feature of the invention resides in the interconnection between the master switch, the individual magnetic switches and the push button stations whereby the operation of the master push buttons will light all of the lamps controlled by the master switch, but any group of the said lamps may be thereafter turned out by its individual push buttons. Similarly, when the master switch has been operated to turn out all of the lamps controlled thereby, any group of lamps may be lighted by one of its individual push buttons. By the provision of a plurality of master switches, any desired combination of groups of lamps may be operated from master push button stations. For example, all of the lamps on one floor of a building may be operated from one master switch while the individual room illumination is operated from individual push buttons. Another master switch may control the entire illumination of another floor and still a third master switch may control the illumination of both floors.

Other objects and features of the invention will be fully understood from the accompanying drawings and the following description and claims:

Fig. 1 is a wiring diagram illustrating an example of the connection of the lamps, the subordinate switches, and the master switches. Fig. 2 is an elevational view of the preferred type of master switch. Fig. 3 is a sectional view of the said master switch taken on the line 3—3 of Fig. 4. Fig. 4 is a side elevation of the said master switch. Fig. 5 is a horizontal sectional view on the line 5—5 of Fig. 4. Fig. 6 is an elevational view of the preferred type of switch for control of the individual illumination circuits. Fig. 7 is a side elevational view of the same switch.

In the drawings a master switch is illus-

trated, including a pair of outer frame members 10, enclosing a laminated magnetic path member 11 and insulation pieces 12 and 113. Each of the outer frame members 10 and the laminated magnetic path member 11 is formed with a pair of rectangular openings 14 within one of which is positioned an electromagnet 15 and within the other an electromagnet. The said electromagnet 15 is fitted with an internal sleeve 16 and a magnetic armature 17. The insulation block 12 is located as shown in the drawings adjacent the lower central portion of the frame members 10. The insulation block 13 is positioned adjacent the lower outer edges of the frame members 10. The armature 17 is positioned so that it may drop into the space between the insulation members 12 and 13. The insulation block 13 carries embedded therein a plurality of electrical contact members 18 herein shown ten in number. Each of these contact members 18 is used in the control circuit for closing one of the illuminating circuits. With the switch here shown therefore ten such illumination circuits may be controlled. The insulation piece 12 carries at one side an electrical contact member 19. The magnetic armature 17 carries an electrical contact member 20 suitably insulated therefrom. In the upward and downward travel of the armature the contact member 20 is adapted to make substantially continuous contact with the contact member 19. The contact member 20 is also adapted to successively make contact with each of the contact members 18 in both the upward and downward travel of the armature.

The armature 17 carries near its lower end a pin 21 projecting through an opening 22 in the frame members 10. A substantially T-shaped member 23 is pivotally mounted by a screw 24 to one of the frame members 10. The central portion 25 of the T-member 23 is spaced from the frame member 10 sufficiently to prevent engagement of the pin 21 therewith. The T-member 23 carries an upper and a lower inwardly bent portion 26, each of which projects into the path of the pin 21. The T-member 23 also carries a block 27 of insulation material. The block 27 is maintained in frictional engagement with the frame member 10 by means of the screw 24 to prevent accidental movement of the T-member 23.

Embedded in the insulation member 12 are a plurality of electrical contact members 28, 29, 30 and 31. The contact member 31 has a flexible portion 32 which projects into the path of the block 27 carried by the T-member 23. The contact member 30 has a downwardly projecting portion 33 adapted to contact with the projecting portion 32 of the member 31. The contact member 28 has a flexible portion 34 projecting into the path of the block 27 and the contact member 29 has an upwardly projecting portion 35 adapted to make contact with the portion 34. The contact member 30 is directly connected to the before mentioned contact member 19. The contact members 28 and 29 are placed in the circuit for energizing the electromagnet 15 as will be hereinafter described in more detail.

In the operation of this switch the energizing of the electromagnet 15 causes the armature to be lifted until the pin 21 strikes the upper portion 26 of the T-member 23. This causes an upward motion of said T-member to bring the block 27 into contact with the flexible portion 34 of the contact member 38. The flexible portion 34 is thereby bent and breaks contact with portion 35 of member 29. The breaking of this contact deenergizes magnet 15 and allows the armature 17 to drop until the pin 21 strikes the lowermost portion 26 of the T-member 23. This causes a reverse motion of the T-member 23 to bring the block 27 into contact with the flexible portion 32 of contact member 31. The contact between contact members 32 and 31 is thereby broken. It will be noticed that contact members 28 and 29 are shown in contact and members 30 and 31 will be in contact only in the downward stroke of the armature. As will be more completely described hereinafter, the supply of current to the contact member 19 is dependent upon the contact between members 30 and 31. Therefore, current is supplied to contact member 19 and to the contact members 18 only on the down stroke of the plunger.

Associated with the magnet 115 there are a plurality of parts numbered from 113 to 135 inclusive having the same form and function as the respective parts numbered from 13 to 35 in the preceding description. In the illustration of a complete wiring system to be hereinafter described the parts associated with magnet 15 are used for operating a plurality of control circuits associated with contact members 18 for closing the several illumination circuits. The parts associated with magnet 115 are similar used for operating control circuits associated with contact members 118 for opening the several illumination circuits.

The preferred type of individual switch for the control of individual illumination circuits is illustrated in Figs. 6 and 7 wherein a pair of rectangular frame members 40 enclose a laminated magnetic path member 41. The frame members 40 and the magnetic path member 41 are provided with a pair of rectangular openings 42 within which are positioned electromagnets 43 and 44. A common armature 45 is provided for both magnets and will be moved to the left when electromagnet 43 is energized and to the right when electromagnet 44 is energized. Since the switch is

positioned with the armature travel in a horizontal direction, the armature will remain in either position with both magnets deenergized. A pin 46 projects through the frame member 40 and the magnet path member 41 and serves as a pivot for a yoke lever 47. The yoke lever 47 comprises a pair of arms 48 positioned on opposite sides of the switch proper each formed with a hole 49. A pin 50 is carried by the armature 45 and projects through openings 51 in the frame members 40 and through the holes 49. The pin 50 is of smaller diameter than the holes 49 and is normally maintained in contact with one edge of each of said holes by a pair of leaf springs 52 suitably mounted upon the arms of the yoke lever 47.

The yoke lever 47 carries at its outer end an electrical contact member 53 adapted to contact with a pair of stationary contact members 54. Contact members 54 are carried upon a suitable insulated support 55. An insulation piece 56 carries electrical terminals 57, 58 and 59 connected to the electromagnets 43 and 44 by wires 60. The entire switch assembly is supported upon insulation piece 55 by means of spring clips 61 bearing upon the terminals 57, 58 and 59 and by spring clips 62 bearing upon the frame members 40. The entire assembly may be easily and quickly removed, therefore, in the same manner as the common type of removable fuse link. Suitable abutments 63 are provided at each end of the switch assembly to prevent horizontal motion thereof.

In the operation of this switch from the position illustrated in the drawings, the magnet 44 is energized to draw the armature to the right. Since there is considerable frictional pressure between the contact members 53 and the contact member 54 the first movement of the armature serves merely to depress the springs 52. When the pin 50 strikes the opposite side of the holes 49, the armature has gained sufficient momentum to overcome said frictional resistance and the contact between member 53 and members 54 is broken. The breaking of this frictional connection allows the springs 52 to accelerate the travel of the yoke member 47 thus insuring a quick break with the minimum arcing.

It will be noticed that the switch will be opened and will remain open by an instantaneous energizing of the magnet 44. An instantaneous energizing of the magnet 43 will likewise serve to bring the contact 53 again into contact with the members 54.

In the wiring diagram Fig. 1 is illustrated an example of the method of connecting the master switch and individual switches just described for the control of a plurality of light circuits. In this diagram electrical current of the usual high voltage type for light circuits is supplied by main power lines 70 and 71. The power line 70 is connected through fuses 72 to one of the terminals 54 of each of the individual switches. The power line 71 is connected to a line 73 which serves as a common return line for all of the lighting circuits. The lamps to be lighted are divided into a plurality of groups designated in the wiring diagram by the letters LA, LB, LC, LD, LE, LF, LG, LH, LI and LJ. The power line 75 for group LA is connected to the second of the terminals 54 of one of the individual switches. In the diagram the individual switches are marked with the letters SA, SB, SC, SD, SE, SF, SG SH, SI and SJ, the power line 75 for lighting group LA being connected to the terminal 54 of individual switch SA and other groups being similarly connected to the corresponding individual switches. By means of this wiring, it will be apparent that instantaneous actuation of one of the solenoids 43 will operate the corresponding individual switch to supply power to the corresponding group of lamps. Thereafter an instantaneous actuation of the corresponding magnet 44 will actuate the said switch to break the current supplied to the said group of lamps.

For the operation of the low voltage circuits for actuation of the said magnets, a transformer 76 is provided having a primary winding 77 directly connected to the power line 71. The secondary winding 78 of the transformer has one terminal connected by means of a line 79, to the contact members 31 and 131 of the master switches and to one terminal of each of a plurality of push buttons 80. The opposite terminal of the secondary winding is connected by line 81 to one terminal of each of the magnets 43, 44, 15 and 115 and thus serves as a common return line for all of said magnets. The push buttons are herein shown arranged in pairs and lettered PA, PB, PC, PD, PE, PF, PG, PH, PI and PJ. The upper push button in each pair PA is connected by a line 82 with the electromagnet 43 in individual switch SA. The lower push button in each pair PA is similarly connected by a line 83 with magnet 44 in switch SA. The remaining push buttons are similarly connected to the proper individual switches.

It will be noticed that as many push buttons as may be desired may be directly connected to the same magnet and that each of said push buttons may provide the instantaneous actuation of said magnet independently of the others. Each of the contact members 18 in the master switch is likewise connected to one of the magnets 43, and contact members 118 are similarly connected to the magnets 44. The energizing of these contact members will, therefore, similarly provide the instantaneous actuation of the magnets 43 and 44 independently of the push button stations. By this wiring the push

buttons may be operated to control the individual switches for lighting and turning out the lamps operated thereby independently of the master switch and independently of other push buttons which may be connected for the same purpose. Similarly, the operation of the master switch may operate all of the individual switches connected thereto for turning the lamps on or off independently of any of the push button stations. Also, as many master switches as desired may be used independently of the push buttons and other master switches and each master switch may control a different group of illuminating circuits. Each individual illumination circuit may be included in or excluded from the group controlled by each master switch as desired.

For the operation of the master switch a plurality of pairs of push buttons herein marked "M" are provided. One terminal of each of these push buttons is connected to the common line 79. The opposite terminal of the upper push button in each pair is connected by line 84 with the contact member 29 of the master switch. The contact member 28 is connected to the magnet 15. The operation of this push button, therefore, energizes magnet 15 to elevate armature 17 in the master switch. The breaking of the contact between members 28 and 29 as previously described allows the said armature to drop. In the downward travel of the armature the contact is complete between contact members 30 and 31 and an instantaneous current is thereby supplied to each of the contact members 18 and through them to each of the magnets 43. The operation of the upper push button M, therefore, causes the operation of each of the individual switches connected to the master switch to light all of the lamps controlled thereby. Similarly, the lower push button M in each pair is connected by line 86 to the contact member 129 of the master switch. The contact members 118 are connected to the magnets 44 as before described. The operation of this push button, therefore, serves to turn off all of the lamps controlled by the individual switches connected to the master switch.

It will be noticed that as many master push buttons as desired may be similarly connected to the master switch and operated independently of each other.

The invention claimed is:

1. An electric lighting system including a plurality of lighting circuits, a magnetic switch for each circuit having a circuit closing electromagnet by the instantaneous actuation of which said circuit is closed, control circuits for actuation of said electromagnets, manual switching means in said last-mentioned circuits for operation thereof, a magnetic master switch connected to a plurality of said control circuits, said master switch including a contact member movable when said master switch is actuated to complete and immediately break each of said control circuits to provide instantaneous actuation of said electromagnets for closing the lighting circuits associated therewith independently of said manual switching means, and a control circuit for actuation of said master switch.

2. An electric lighting system including a plurality of lighting circuits, a magnetic switch for each circuit having a circuit closing electromagnet by the instantaneous actuation of which said circuit is closed, control circuits for actuation of said electromagnets, manual switching means in said last-mentioned circuits for operation thereof, a magnetic master switch connected to a plurality of said control circuits, said master switch including a contact member movable when said master switch is actuated to complete and immediately break each of said control circuits to provide instantaneous actuation of said electromagnets for closing the lighting circuits associated therewith independently of said manual switching means, and a control circuit for actuation of said master switch, said last-mentioned circuit including a plurality of parallel connected push buttons for operation thereof.

3. An electric lighting system including a plurality of lighting circuits, a magnetic switch for each circuit having a circuit closing electromagnet by the instantaneous actuation of which said circuit is closed, control circuits for actuation of said electromagnets, manual switching means in said last-mentioned circuits for operation thereof, a magnetic master switch connected to a plurality of said circuit closing magnets and adapted when actuated to provide instantaneous and successive actuation of said electromagnets for closing the lighting circuits associated therewith independently of said manual switching means, and a control circuit for actuation of said master switch.

4. An electric lighting system including a plurality of lighting circuits, a magnetic switch for each circuit having a circuit closing electromagnet by the instantaneous actuation of which said circuit is closed, control circuits for actuation of said electromagnets, manual switching means in said last-mentioned circuits for operation thereof, a magnetic master switch connected to a plurality of said circuit closing electromagnets and adapted when actuated to provide instantaneous and successive actuation of said electromagnets for closing the lighting circuits associated therewith independently of said manual switching means, and a control circuit for actuation of said master switch, said last-mentioned circuit including a plu-

rality of parallel connected push buttons for operation thereof.

5. An electric lighting system including a plurality of lighting circuits, a magnetic switch for each circuit having a circuit opening electromagnet by the instantaneous actuation of which said circuit is opened, control circuits for actuation of said electromagnets, manually operable switch means in said last-mentioned circuits for manual operation thereof, a magnetic master switch connected to a plurality of said control circuits, said master switch including a contact member movable when said master switch is actuated to complete and immediately break each of said control circuits to provide instantaneous actuation of said electromagnets for opening the lighting circuits associated therewith independently of said manual switch means, and a control circuit for actuation of said master switch.

6. An electric lighting system including a plurality of lighting circuits, a magnet switch for each circuit having a circuit opening electromagnet by the instantaneous actuation of which said circuit is opened, control circuits for actuation of said electromagnets, manual switching means in said last mentioned circuits for manual operation thereof, a magnetic master switch connected to a plurality of said control circuits, said master switch including a contact member movable when said master switch is actuated to complete and immediately break each of said control circuits to provide instantaneous actuation of said electromagnets for opening the lighting circuits associated therewith independently of said manual switching means, and a control circuit for actuation of said master switch, said last-mentioned circuit including a plurality of parallel connected push buttons for operation thereof.

7. An electric lighting system including a plurality of lighting circuits, a magnetic switch for each circuit having a circuit opening electromagnet by the instantaneous actuation of which said circuit is opened, control circuits for actuation of said electromagnets, manually operable switch means in said last-mentioned circuits for manual operation thereof, a magnetic master switch connected to a plurality of said circuit opening electromagnets and adapted when actuated to provide instantaneous and successive actuation of said electromagnets for opening the lighting circuits associated therewith independently of said manual switch means, and a control circuit for actuation of said master switch.

8. An electric lighting system including a plurality of lighting circuits, a magnet switch for each circuit having a circuit opening electromagnet by the instantaneous actuation of which said circuit is opened, control circuits for actuation of said electromagnets, manual switching means in said last-mentioned circuits for manual operation thereof, a magnetic master switch connected to a plurality of said circuit opening electromagnets and adapted when actuated to provide instantaneous and successive actuation of said electromagnets for opening the lighting circuits associated therewith independently of said manual switching means, and a control circuit for actuation of said master switch, said last-mentioned circuit including a plurality of parallel connected push buttons for operation thereof.

9. An electric lighting system including a plurality of lighting circuits, a magnetic switch for each circuit having a circuit-closing electromagnet by the actuation of which said circuit is closed, control circuits for actuation of said electromagnets, manual switching means in said last-mentioned circuits for operation thereof, and a magnetic master switch connected to a plurality of said circuit-closing magnets, said master switch including a master electromagnet, means for preventing the actuation of said circuit-closing electromagnets when said master electromagnet is energized, means for deenergizing said master electromagnet immediately after the energizing thereof, and a member movable upon said deenergizing to actuate said circuit-closing electromagnets.

10. An electric lighting system including a plurality of lighting circuits, a magnetic switch for each circuit having a circuit-closing electromagnet by the actuation of which said circuit is closed, control circuits for actuation of said electromagnets, manual switching means in said last-mentioned circuits for operation thereof, and a magnetic master switch connected to a plurality of said circuit-closing magnets, said master switch including a master electromagnet, an armature movable in one direction upon actuation of said master electromagnet, means for deenergizing said electromagnet upon completion of said movement, means for returning said armature to its initial position upon deenergizing said electromagnet, and electrical contact members operable in the return movement of said armature for the actuation of said circuit-closing electromagnets.

In witness whereof, I have hereunto affixed my signature.

HARRY B. MARSH.