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M. J. NOREGAARD

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MULTIPLE CIRCUIT CARD KEY SWITCH ASSEMBLY

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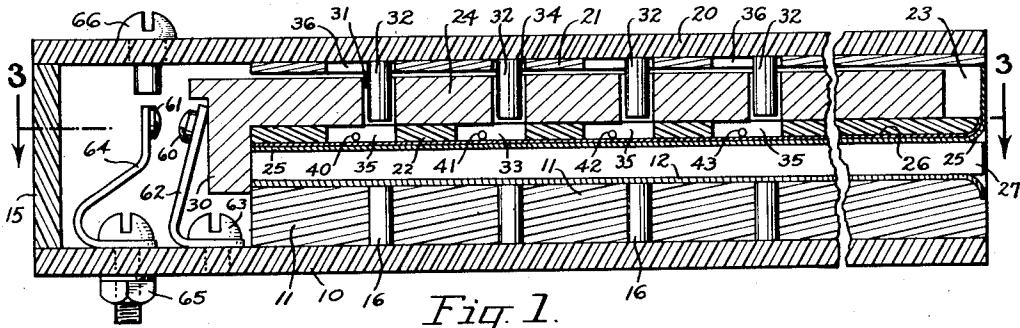


Fig. 1.

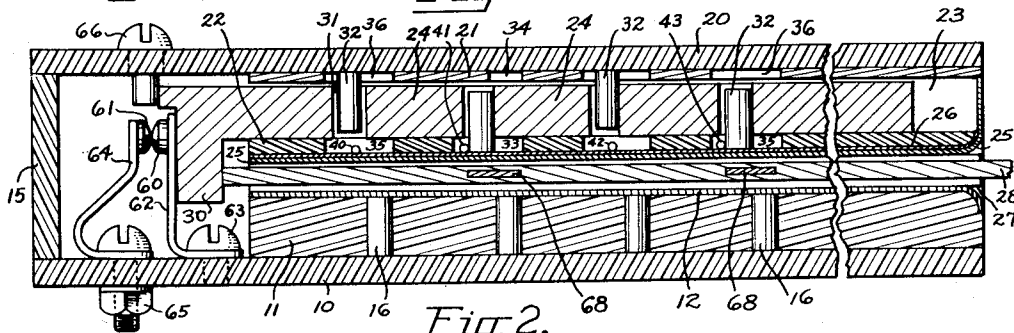


Fig. 2.

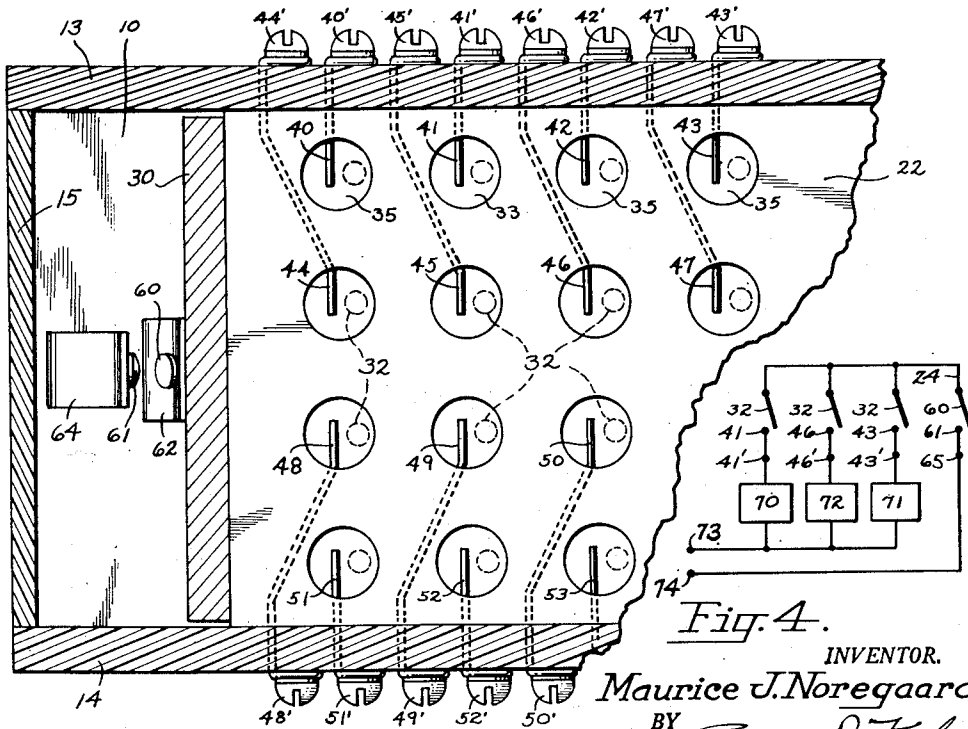


Fig. 3.

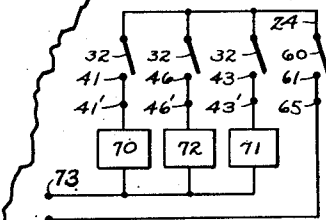


Fig. 4.

INVENTOR.

Maurice J. Noregaard

BY

Eugene A. Farley

Atty.

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MULTIPLE CIRCUIT CARD KEY SWITCH ASSEMBLY

Maurice J. Noregaard, Los Angeles, Calif.

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21 Claims. (Cl. 200—87)

This invention pertains to electric switches, and relates particularly to a multiple circuit switch by which a plurality of electrical circuits may be actuated selectively in any combination desired by means of a plurality of keys each adapted for use with the switch.

It is a principal object of the present invention to provide a switch having a plurality of electrical contacts which may be arranged in various combinations in various electrical circuits to be controlled by the switch, each combination of electrical contacts being actuated selectively by means of a different key.

Another important object of this invention is the provision of a switch adapted to control a plurality of electrical circuits and which is activated in various selective combinations by means of different keys, all of which are accommodated by the switch and appear to be identical.

A further important object of the present invention is to provide a multiple circuit switch which includes an alarm circuit which is activated upon insertion of a wrong key or other unauthorized object, whereby to render the switch pick proof.

A still further important object of the present invention is the provision of a multiple circuit switch having a plurality of electrical contacts which may be arranged in various combinations in various electrical circuits and wherein each of said electrical contacts includes a magnet adapted to be actuated by a magnetic element carried in the key, the plurality of magnets being arranged in the switch in various patterns corresponding to the pattern of the magnetic element in the key for actuating a particular circuit.

Still another important object of the present invention is to provide a multiple circuit switch which is extremely compact in construction to afford minimum size and yet is capable of actuating a great number of electrical circuits by the provision of an equal number of keys, thereby rendering the switch particularly applicable to the control of doors, turnstiles, etc. in defense plants and other places where security is maintained.

The foregoing and other objects and advantages of the present invention will appear from the following detailed description taken in connection with the accompanying drawing, in which:

Figure 1 is a foreshortened sectional view in side elevation of a switch embodying the features of this invention, the elements thereof being shown in their normal, unoperated, positions;

Figure 2 is a view similar to Figure 1, and showing the switch in operated condition, as actuated by a key adapted for use with said switch;

Figure 3 is a fragmentary sectional view taken along the line 3—3 in Figure 1; and

Figure 4 is a schematic diagram, partly in block form, illustrating various combinations of electrical contacts in series with various electrical circuits, as afforded by the switch of the present invention.

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Referring to the drawing, the switch comprises two main sections, namely the base section and the locking pin section. The base section includes a cover plate 10, the fixed magnet housing 11 and the shield 12. The cover plate 10 and housing 11 are preferably constructed of plastic or other electrically non-conducting and non-magnetic material, while the shield 12 is preferably constructed of non-magnetic metal to provide a smooth surface resistant to wear. Side plates 13 and 14 and rear wall 15 are secured to the base plate 10 and extend upwardly therefrom.

The housing 11 is perforated transversely to accommodate a plurality of magnets 16 fixed therein in a predetermined pattern, as explained in detail hereinafter.

The locking pin section includes the electrically non-conductive and non-magnetic cover plate 20, the locking plates 21 and 22 supported in spaced relation by the laterally spaced non-conductive guide bars 23, the locking pin plate 24 interposed between the locking plates and between the spaced guide bars, and the shield 25. Locking plate 21 and locking pin plate 24 are preferably constructed of metal such as copper or other non-magnet material, while locking plate 22 is constructed of electrically non-conductive and non-magnetic material such as plastic. Shield 25 is preferably constructed as shield 12, of non-magnetic metal to provide a smooth surface resistant to wear.

Interposed between locking plate 22 and shield 25 is a sheet of plastic or other electrically non-conductive material 26, which functions as an electrical insulation for purposes described in detail hereinafter.

The base section and the locking pin section are arranged in superimposed relation with their respective shields 12 and 25 facing each other but separated by the laterally disposed spacer plates 27. The entire assembly is secured together along the sides thereof by means of screws or bolts (not shown), or other means adapted for this purpose, as will be recognized by those skilled in the art.

The spacer plates 27 are slightly thicker than the thickness of the card key 28 (Figure 2) and the spacing between said plates is slightly greater than the width of the key. In this manner the card key is receivable in the slot formed between the plates 27 and the shields 12 and 25 for purposes of operating the switch, as explained in detail hereinafter. The forward ends of the spacer plates 27 are preferably cut away obliquely to form an enlarged entrance for facilitating the insertion of the key.

The locking pin plate 24 is contained freely within the space defined by the lateral guide bars 23 and the locking plates 21 and 22, thereby permitting the locking pin plate to be reciprocated therein. A flange 30 extends downwardly from the rearward end of the locking pin plate and projects across the rearward end of the central slot formed between the spaced shields 12 and 25 for engagement by the inserted end of the card key 28, as illustrated in Figure 2.

Transverse holes 31 are formed in the locking pin plate 24 in the pattern of and for cooperative registration with the fixed magnets 16 provided in the housing 11. Magnetic locking pins 32 are disposed for sliding movement in the said holes and are slightly longer than the thickness of the locking pin plate. Each of the locking pins and their cooperating fixed magnets 16 are arranged with like poles facing each other across the shields 12, 25. In this manner the magnetic forces of repulsion maintain the pins 32 normally at their farthest position from the fixed magnets 16, i. e. when no magnet element is disposed in the slot between the shields 12 and 25, as explained hereinafter.

The locking plates 21 and 22 are provided with trans-

verse openings disposed in cooperating pairs in the pattern of the movable locking pins 32. The openings comprising each pair may be of the same diameter or of different diameters, depending upon the use to which a particular locking pin is to be put. In the event openings of different diameters are provided, the smaller opening is placed in locking plate 21. Thus, for example, the pair of openings 33, 34 are of different diameters, with opening 33 provided in locking plate 22 and opening 34 provided in locking plate 21. The remaining pairs of openings 35, 36 in the embodiment illustrated in the drawing are of equal diameters, although it will be understood that some of these may be of different diameters, if desired.

Wherever cooperating pairs of openings are provided with different diameters, the larger opening is arranged with its periphery closer to the rearward end of the locking plates than is the periphery of the cooperating smaller openings of the same pair. The smaller opening of each pair functions to receive a locking pin 32 for securing the locking pin plate 24 against rearward movement, while the large opening of each pair receives the locking pin to release the plate 24 for rearward movement, as explained in detail hereinafter.

Secured within the lateral grooves or other means provided in locking plate 22 are a plurality of electrical conductors, preferably in the form of resilient wire. The inner end of each of these conductors extends into one of the openings provided in locking plate 22 rearwardly of the normal position of the magnet 32. The terminal ends of these wires extending into said openings are identified in the drawing by numerals 40 to 53, inclusive, and the outer terminal end of each wire is secured to a terminal binding post identified in the drawing by the corresponding numerals 40' to 53', inclusive.

The inner ends 40 to 53 of the electrical conductors extend a substantial distance across the openings in the locking plate 22, as best shown in Figure 3 of the drawing. These conductors are insulated from the sliding locking pin plate 24 by the plastic plate 22 and insulated from the shield 25 by means of the plastic insulation strip 26 described hereinbefore.

Within the area rearward of the base and locking pin section and enclosed by the walls of the switch is a pair of electrical contact members 60 and 61. Contact 60 is mounted upon a resilient L-shaped member 62 of electrically conductive material, the lower end of which is secured to the cover plate 10 by means of screw 63. Contact 61 is similarly secured to the resilient electrical conductor 64 which, in turn, is secured to cover plate 10 by means of binding post 65.

It is to be noted that the resilient electrical conductor 62 is maintained in contact with the rearward end of the locking pin plate 24 and, by virtue of its resilience, tends to return the locking pin plate to its forwardmost position indicated in Figure 1 of the drawing. Thus, the switch is actuated by placing the proper card key 28 in the slot between the shields 12 and 25 in abutment with the extension 30 of the locking pin plate 24 and then pushing rearwardly against the resistance of the resilient conductor 62 until contact 60 engages with contact 61. Further rearward movement of the locking pin plate 24 is prevented by means of the abutment screw 66 secured in the top cover plate 20 for engagement by the rearward end of the locking pin plate 24, as indicated in Figure 2.

The electrical circuit of the switch described hereinbefore extends from binding post 65 through resilient conductor 64 and contacts 61, 60 and thence through resilient conductor 62 and the contacting locking pin plate 24, through the magnets 32 and the ends of the electrical conductors extending into the openings in locking plate 22. This circuit is completed when a conductor wire is brought in contact with the corresponding magnet 32, when the latter is drawn downwardly by

means of the key 28, and when locking pin plate 24 is moved rearwardly by the key.

The key 28 employed to operate the switch may comprise a card made of fibrous layers in the interior of which are placed a plurality of magnetic elements 68. These elements may be pieces of shim steel or the like or, alternatively, they may comprise patches of iron filings or other suitable magnetic material applied by means of an adhesive or otherwise affixed to the card. In any case, the pattern of magnetic elements must correspond with the pattern of the smaller openings 34 in locking plate 21 from which it is desired to remove the magnet 32 in order to unlock the locking pin plate 24 for movement. In addition, the card key 28 must have one or more magnetic elements 68 positioned to correspond with one or more of the magnets 32 desired to be drawn downwardly to contact the cooperating electrical conductors projecting into the openings in the locking plate 22 for purposes of actuating a particular electrical circuit.

To exemplify the foregoing description, reference is made to Figure 4 of the drawing wherein is shown an electrical circuit exemplifying the operation of the switch. Let it be assumed that the switch of the present invention is to be used in a defense plant for controlling the operation of a door 70, a time clock 71 and an alarm 72, each of which is actuated by a source of electrical potential supplied at terminals 73 and 74. Each of the devices 70, 71 and 72 is connected at one side to terminal 73, while terminal 74 is connected through binding post 65 of contact 61. The door actuator 70 is connected at its other end to terminal 41' and its electric circuit is completed through flexible wire 41 engageable with magnet 32 which completes the circuit through the electrically conducting locking pin plate 24 to contact 60. In similar manner, time clock 71 is connected at its opposite end to terminal 43' and its electric circuit is completed through wire 43 and magnet 32 through locking pin plate 24 to contact 60.

The alarm 72 is provided to insure against unauthorized entry to the defense area by means of a forged card 28 or other means intended to actuate the door 70. Accordingly, let it be assumed that resilient wire 46 functions to close the circuit of the alarm 72, as shown in Figure 4. Thus, in the event that a magnetic element were inserted in the switch in place of key 28 to actuate the door 70, it would also actuate the magnet associated with wire 46 to complete the circuit of the alarm and thereby give positive evidence of the intruder.

It is to be noted that, in the operation of the switch described hereinbefore, the insertion of key 28 with the appropriate magnetic elements 68 arranged therein first actuates the magnets 32 downwardly into position for contact with the flexible wires 41 and 43. Then, upon further rearward movement of the card key 28, the magnets 32 are brought into engagement with said wires before the locking pin plate 24 has been moved rearwardly to a point sufficient to close the contacts 60, 61. In this manner, all arcing which might occur in the making of the electric circuit occurs between the contacts 60, 61 rather than between the magnets 32 and the cooperating wires associated therewith. Upon withdrawal of the card key 28, the contacts 60, 61 are broken before the magnets and the associated wires are disengaged, and thus any arcing which might occur during the breakage of the electric circuit will occur at the contact 60, 61. These contacts are made of heavy material to accommodate such arcing, and may be replaced without difficulty.

As stated hereinbefore, the magnetic elements 68 provided in the card key 28 preferably comprise small pieces of thin flexible shim steel or similar magnetic material having an area approximately four times the area of the ends of magnets 32. When pieces of this stock are interposed between two or more layers of fibrous material and the latter then glued together to form a card, the

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resulting card is indistinguishable by ordinary inspection methods from a card not containing the magnetic elements. Hence, it may be flexed, pressed between the fingers, or otherwise inspected without being able to trace the pattern of the functional elements.

From the foregoing description it is apparent that the present invention provides a versatile switch which may be used to control a large variety of electrical circuits. For example, a switch constructed in such size as to be readily accommodated within a wall and actuated by a card of the general type utilized as identification means, i. e. about 2½" by 4" in area, readily accommodates 42 of the magnets 32. Thus, a large number of combinations of patterns are available, thereby affording the use of a large number of card keys such as is required for large numbers of personnel, for example in a defense plant. By such a large number of combinations the switch is also rendered substantially pick proof.

The switch is of rugged construction to accommodate circuits carrying large current loads by virtue of the actuation of the main contacts 60, 61 by manual pressure applied to a key after the magnets and their associated resilient wire conductors have been brought into contact, both in making and in breaking an electric circuit. On the other hand, the switch is capable of delicate and precise operation by virtue of the floating magnets 32 being immediately reactive to the magnetic elements carried in the key.

It will be apparent to those skilled in the art that various details of construction described hereinbefore may be changed or modified without departing from the scope and spirit of this invention. For example, it will be apparent that the repelling magnets 16 carried in the base section of the switch may be omitted by inverting the switch and utilizing gravity to hold the locking magnets 32 in their normal position within the openings of the locking plate 21. The use of the repelling magnets is preferred, however, since the resulting floating condition of the locking magnets renders the latter more quickly and positively responsive to the attractive influence of the magnetic elements the card key 28.

Various combinations may be provided with the plurality of magnets and their associated resilient wire conductors. For example, the switch comprising magnet 32 and conductor 41 may actuate a relay for closing electrical contacts in another circuit in which, for example, the switch comprising a magnet 32 and conductor 50 is in series and in which circuit is included a device to be actuated. In such instance, it is seen that a key 28 is required to include magnetic elements 68 for actuating both magnets associated with conductors 41 and 50 in order to complete the electrical circuit of the device to be operated.

The foregoing and other changes and modifications may be made, as will be apparent to those skilled in the art. Accordingly, it is to be understood that the foregoing description is primarily illustrative of the invention and is not to be considered as limiting the scope thereof.

Having now described my invention and the manner in which the same may be used, what I claim as new and desire to secure by Letters Patent is:

1. An electric switch comprising, in combination, a locking pin section including a locking member having an opening therein, a locking pin member reciprocative longitudinally with respect to the locking member, an electrically conductive locking pin magnet disposed for transverse movement in the locking pin member and arranged for registration with the opening in the locking member, and electrical conductor means extending into the opening, the magnet being normally removed from the opening and adapted upon activation by a magnetic force to be drawn into said opening for contact with the conductor means upon movement of the said locking pin member to complete the circuit of the switch.

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2. An electric switch comprising, in combination, a locking pin section including a locking member having an opening therein, a locking pin member reciprocative longitudinally with respect to the locking member, an electrically conductive locking pin magnet disposed for transverse movement in the locking pin member and arranged for registration with the opening in the locking member, electrical conductor means extending into the opening, the magnet being normally removed from the opening and adapted upon activation by a magnetic force to be drawn into said opening for contact with the conductor means upon movement of the said locking pin member, a first electrical contact electrically engaging the magnet, a second electrical contact adjacent the first contact for releasable engagement therewith, and means for connecting the second contact and the conductor means in an electric circuit.

3. An electric switch comprising, in combination a locking pin section including a locking member having an opening therein, an electrically conductive locking pin member reciprocative longitudinally with respect to the locking member, an electrically conductive locking pin magnet disposed for transverse movement in the locking pin member and arranged for registration with the opening in the locking member, electrical conductor means extending into the opening, the magnet being normally removed from the opening and adapted upon activation by a magnetic force to be drawn into said opening for contact with the conductor means upon movement of the said locking pin member, and means for connecting the locking pin member and the conductor means in an electric circuit.

4. An electric switch comprising, in combination a locking pin section including a locking member having an opening therein, an electrically conductive locking pin member reciprocative longitudinally with respect to the locking member, an electrically conductive locking pin magnet disposed for transverse movement in the locking pin member and arranged for registration with the opening in the locking member, electrical conductor means extending into the opening, the magnet being normally removed from the opening and adapted upon activation by a magnetic force to be drawn into said opening for contact with the conductor means upon movement of the said locking pin member, a first electrical contact resiliently engaging the locking pin member, a second electrical contact adjacent the first contact for releasable engagement therewith, and means for connecting the second contact and the conductor means in an electric circuit.

5. A multiple circuit electric switch comprising, in combination, a locking pin section including a locking member having openings therein, a locking pin member reciprocative longitudinally with respect to the locking member, a plurality of electrically conductive locking pin magnets disposed for transverse movement in the locking pin member and each arranged for registration with one of the openings in the locking member, and electrical conductor means extending into each opening, each magnet being normally removed from the opening and adapted upon activation by a magnetic force to be drawn into said opening for contact with the conductor means upon movement of the said locking pin member to complete the circuit of the switch.

6. A multiple circuit electric switch comprising, in combination, a locking pin section including a locking member having openings therein, an electrically conductive locking pin member reciprocative longitudinally with respect to the locking member, a plurality of electrically conductive locking pin magnets disposed for transverse movement in the locking pin member and each arranged for registration with one of the openings in the locking member, electrical conductor means extending into each opening, each magnet being normally removed from the opening and adapted upon activation by a magnetic force

to be drawn for said opening into contact with the conductor means upon movement of the said locking pin member, and means for connecting the locking pin member and each conductor means in an electric circuit.

7. A multiple circuit electric switch comprising, in combination, a locking pin section including a locking member having openings therein, a locking pin member reciprocative longitudinally, with respect to the locking member, a plurality of electrically conductive locking pin magnets disposed for transverse movement in the locking pin member and each arranged for registration with one of the openings in the locking member, electrical conductor means extending into each opening, each magnet being normally removed from the opening and adapted upon activation by a magnetic force to be drawn into said opening for contact with the conductor means upon movement of the said locking pin member, a first electrical contact electrically engaging each magnet, a second electrical contact adjacent the first contact for releasable engagement therewith, and means for connecting the second contact and each conductor means in an electric circuit.

8. A multiple circuit electric switch comprising, in combination, a locking pin section including a locking member having openings therein, an electrically conductive locking pin member reciprocative longitudinally with respect to the locking member, a plurality of electrically conductive locking pin magnets disposed for transverse movement in the locking pin member and each arranged for registration with one of the openings in the locking member, electrical conductor means extending into each opening, each magnet being normally removed from the opening and adapted upon activation by a magnetic force to be drawn into said opening for contact with the conductor means upon movement of the said locking pin member, a first electrical contact resiliently engaging the locking pin member, a second electrical contact adjacent the first contact for releasable engagement therewith and means for connecting the second contact and each conductor means in an electric circuit.

9. A multiple circuit electric switch comprising, in combination, a locking pin section including a pair of locking members having cooperating pairs of openings therein, a locking pin member reciprocative longitudinally with respect to the locking members, a plurality of electrically conductive locking pin magnets disposed for transverse movement in the locking pin member and each arranged for registration with one of the openings in the locking members, and electrical conductor means extending into one opening of each pair, each magnet being normally removed from the opening containing the conductor means and adapted upon activation by a magnetic force to be drawn into said opening for contact with the conductor means upon movement of the said locking pin member to complete the circuit of the switch.

10. A multiple circuit electric switch comprising, in combination, a locking pin section including a pair of spaced locking members having cooperating pairs of openings therein, an electrically conductive locking pin member disposed between the locking members and reciprocative longitudinally with respect thereto, a plurality of electrically conductive locking pin magnets disposed for transverse movement in the locking pin member and each arranged for registration with one of the openings in the locking members, electrical conductor means extending into one opening of each pair, each magnet being normally removed from the opening containing the conductor means and adapted upon activation by a magnetic force to be drawn into said openings for contact with the conductor means upon movement of the said locking pin member, and means for connecting the locking pin member and each conductor means in an electric circuit.

11. A multiple circuit electric switch comprising, in combination, a locking pin section including a pair of locking members having cooperating pairs of openings

therein, an electrically conductive locking pin member reciprocative longitudinally with respect to the locking members, a plurality of electrically conductive locking pin magnets disposed for transverse movement in the locking pin member and each arranged for registration with one of the openings in the locking members, electrical conductor means extending into one opening of each pair, each magnet being normally removed from the opening containing the conductor means and adapted upon activation by a magnetic force to be drawn into said opening for contact with the conductor means upon movement of the said locking pin member, a first electrical contact resiliently engaging the locking pin member, a second electrical contact adjacent the first contact for releasable engagement therewith, and means for connecting the second contact and each conductor means in an electric circuit.

12. An electric switch comprising, in combination, a body including a locking pin section and a base section having a longitudinal slot therebetween, a locking member having an opening therein, a locking pin member reciprocative longitudinally with respect to the locking member, an electrically conductive locking pin magnet disposed for transverse movement in the locking pin member and arranged for registration with the opening in the locking member, electrical conductor means extending into the opening, key means proportioned for insertion in said longitudinal slot and carrying a magnetic element arranged to register with the magnet, the magnet being normally removed from the opening and adapted upon activation by the magnetic key element to be drawn into said opening for contact with the conductor means upon movement of the said locking pin member to complete the circuit of the switch.

13. An electric switch comprising, in combination, a body including a locking pin section and a base section having a longitudinal slot therebetween, a locking member having an opening therein, a locking pin member reciprocative longitudinally with respect to the locking member, an electrically conductive locking pin magnet disposed for transverse movement in the locking pin member and arranged for registration with the opening in the locking member, electrical conductor means extending into the opening, a first electrical contact electrically engaging the magnet, a second electrical contact adjacent the first contact for releasable engagement therewith, key means proportioned for insertion in said longitudinal slot and carrying a magnetic element arranged to register with the magnet, the magnet being normally removed from the opening and adapted upon activation by the magnetic key element to be drawn into said opening, the key means functioning to move the locking pin member to bring the magnet and cooperating conductor means and the first and second contacts into engagement to complete the circuit of the switch, and means for connecting the magnet and the conductor means in an electric circuit.

14. A multiple circuit electric switch comprising, in combination, a body including a locking pin section and a base section having a longitudinal slot therebetween, a locking member having openings therein, a locking pin member reciprocative longitudinally with respect to the locking member, a plurality of electrically conductive locking pin magnets disposed for transverse movement in the locking pin member and each arranged for registration with one of the openings in the locking member, electrical conductor means extending into each opening rearwardly of the magnet, a first electrical contact electrically engaging each magnet, a second electrical contact adjacent the first contact for releasable engagement therewith, key means proportioned for insertion in said longitudinal slot and carrying a magnetic element arranged to register with a magnet, each magnet being normally removed from the opening and adapted upon activation by the magnetic key element to be drawn into said opening, the key means functioning to move the locking pin mem-

ber to bring each magnet and cooperating conductor means and the first and second contacts into engagement to complete the circuit of the switch, and means for connecting the magnet and each conductor means in an electric circuit.

15. The switch of claim 14 including repelling means normally urging the locking pin magnets away from the conductor means.

16. The switch of claim 14 including a plurality of magnets mounted in the base section in the pattern of the locking pin magnets for holding the latter normally away from the conductor means.

17. A multiple circuit electric switch comprising, in combination, a body including a locking pin section and a base section having a longitudinal slot therebetween, a locking member having openings therein, an electrically conductive locking pin member reciprocative longitudinally with respect to the locking member, a plurality of electrically conductive locking pin magnets disposed for transverse movement in the locking pin member and each arranged for registration with one of the openings in the locking member, electrical conductor means extending into each opening rearwardly of the magnet, a first electrical contact resiliently engaging the rearward end of the locking pin member and urging the latter forwardly, a second electrical contact adjacent the first contact for releasable engagement therewith, key means proportioned for insertion in said longitudinal slot and carrying a magnetic element arranged to register with a magnet, each magnet being normally removed from the opening and adapted upon activation by the magnetic key element to be drawn into said opening, the key means functioning to move the locking pin member to bring each magnet and cooperating conductor means and the first and second contacts into engagement to complete the circuit of the switch, and means for connecting the second contact and each conductor means in an electric circuit.

18. A multiple circuit electric switch comprising, in combination, a body including a locking pin section and a base section having a longitudinal slot therebetween, a pair of spaced locking members having cooperating pairs of openings therein, an electrically conductive locking pin member disposed between the locking members and reciprocative longitudinally with respect thereto, a plurality of electrically conductive locking pin magnets disposed for transverse movement in the locking pin member and each arranged for registration with one of the openings in the locking members, electrical conductor means extending into one opening of each pair rearwardly of the magnet, a first electrical contact resiliently engaging the rearward end of the locking pin member and urging the latter forwardly, a second electrical contact adjacent the first contact for releasable engagement therewith, key

means proportioned for insertion in said longitudinal slot and carrying a magnetic element arranged to register with a magnet, each magnet being normally removed from the opening containing the conductor means and adapted upon activation by the magnetic key element to be drawn into said opening, the key means functioning to move the locking pin member to bring each magnet and cooperating conductor means and the first and second contacts into engagement to complete the circuit of the switch, and means for connecting the second contact and each conductor means in an electric circuit.

19. The electric switch of claim 9 wherein the openings of at least one of said cooperating pairs are of different diameters, with the opening containing the electrical conductor means being the larger and the other opening of said pair being substantially the same size as the cross section of the associated magnet, whereby to restrict movement of the locking pin member when the magnet is contained within the last named opening.

20. An electric switch comprising, in combination, an electrical contact, an electrically conductive reciprocative member arranged for removable engagement with the said contact, an electrically conductive magnet disposed for transverse movement in the reciprocative member, electrical conductor means spaced from the reciprocative member and normally spaced from magnet, the magnet being adapted upon activation by a magnetic force to be drawn adjacent said electrical conductor means for contact with the latter upon movement of the reciprocative member into engagement with the said electrical contact, and means for connecting the said electrical contact and the electrical conductor means in an electric circuit.

21. A multiple circuit electric switch comprising, in combination, an electrical contact, an electrically conductive reciprocative member arranged for removable engagement with the said contact, a plurality of electrically conductive magnets disposed for transverse movement in the reciprocative member, a plurality of electrical conductor means spaced from the reciprocating member and each disposed adjacent one of the magnets normally in spaced relation thereto, each magnet being adapted upon activation by a magnetic force to be drawn adjacent the electrical conductor means for contact with the latter upon movement of the reciprocative member into engagement with the said electrical contact, and means for connecting the said electrical contact and each of the electrical conductor means in an electric circuit.

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