

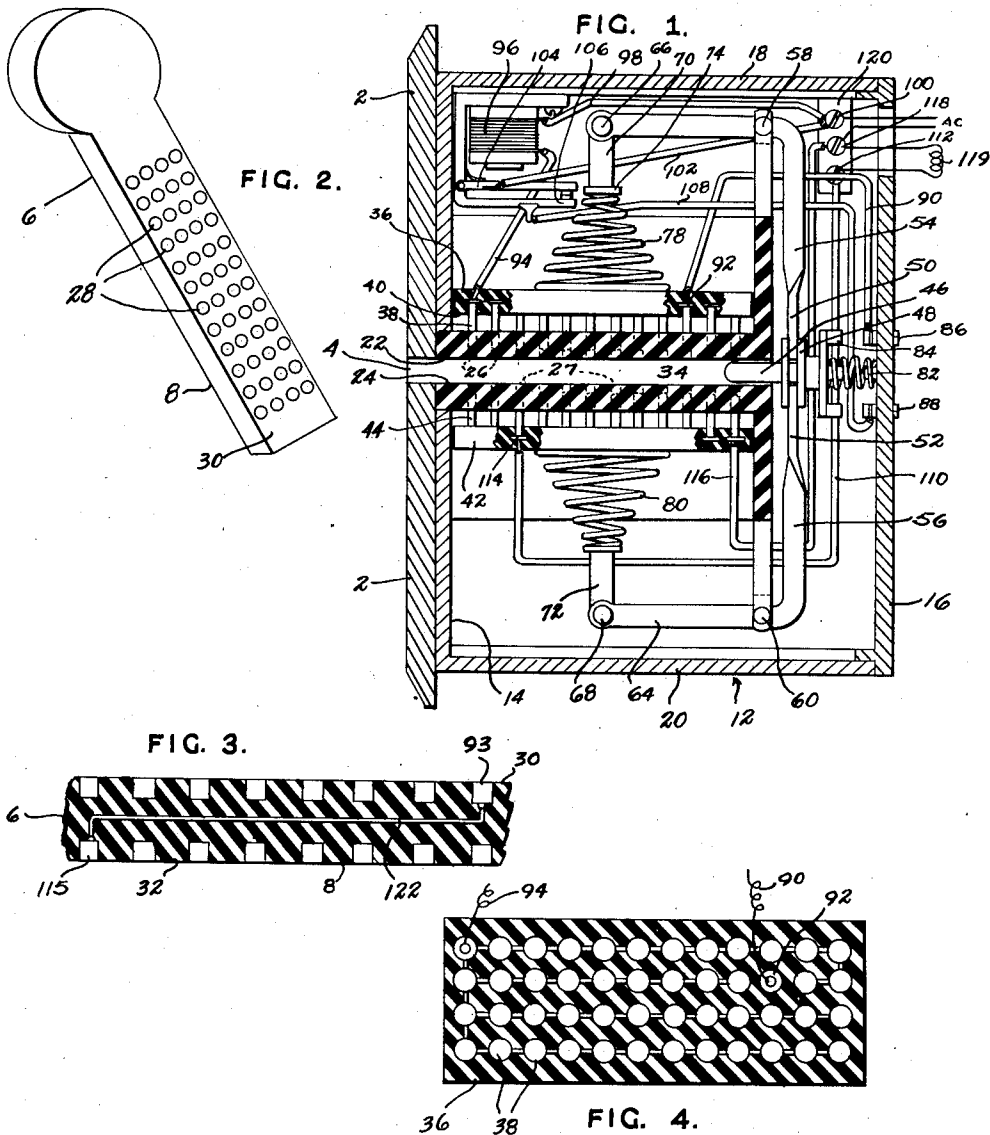
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ELECTRIC LOCKING DEVICE

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ELECTRIC LOCKING DEVICE

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This invention relates to locking devices.

An object of the invention is to provide a lock which is electrically operated, and is pick-proof.

Another object of the invention is to provide a lock which makes use of a key made of insulating material, and which has internal connecting wires within the key connected to contact points in coded locations, for completing the proper circuits for unlocking the device.

A further object of the invention is to avoid the use of intricate mechanical parts, and thus provide a lock which is simple in design, easy and inexpensive to manufacture, and effective in operation.

Another object of the invention is to provide a lock which is electrically operated, and in which, when the wrong key is used, or the wrong side of the key is used, or the mechanism is shorted out, a circuit breaker will act and prevent the lock from opening, the circuit breaker resuming the connection when the short is eliminated.

Other and further objects of the invention will become apparent from the following description of a preferred embodiment thereof, as illustrated in the accompanying drawing, and in which—

Figure 1 is a sectional elevation of my improved pick-proof lock,

Figure 2 is a perspective view of a key suitable for use in the lock shown in Figure 1,

Figure 3 is a longitudinal sectional elevation of a portion of the key shown in Figure 2, and

Figure 4 is a plan view of the upper contact plate shown in Figure 1.

Reference is now had to the illustrations in which similar reference characters denote similar parts throughout the several views, a face plate being indicated at 2. The face plate 2 may be any desired shape such as rectangular or curved as seen from the left side of the view, and has a slot 4 therein through which a key 6 is insertable, the shank 8 of the key entering the hole 4 and the handle 10 of the key remaining outside. The face plate 2 is preferably made of steel, while the key 6 is preferably made of insulating material such as plastic.

The face plate 2 is mounted on a housing 12 having a front wall 14, rear wall 16, top wall 18, bottom member 20, and side members not shown. Inside the housing there are mounted

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an upper and a lower contact guide plate 22 and 24, parallel to each other and formed of insulating material. These guide plates 22 and 24 are spaced apart to provide the key receiving space 4 therebetween and each has a plurality of guide holes 26 and 27 respectively extending through it, there being several rows of holes 26 and 27 to correspond exactly with the number and arrangement of the contact points 28 on both side faces 30 and 32 of the key shank 8. Thus Figure 2 shows that there are four longitudinal rows of contact points on each face of the key shank 8, with 12 points in each row, or a total of 48 contact points. And similarly, upper contact guide plate 22 and lower contact guide plate 24 each has four rows of guide holes 26 and 27 respectively, with 12 holes in each row. It will be understood of course, that the number and arrangement of contact points on key 6 may vary, and that the contact guide plates must match the number and arrangement of the points on the key.

The space 34 between the parallel upper and lower guide plates 22 and 24, forms a passageway aligned with slot 4, through which the shank 8 of the key 6 slides after entering the slot 4. Above the upper guide plate 22 is movably disposed an upper contact plate 36 formed of insulating material such as plastic or the like, with metal contact points 38 protruding downwardly out of the under surface 40 of the plate 36, the contact points 38 being preferably set into the plate 36 during the molding thereof to hold them securely against dislodgment, copper being a suitable metal out of which to make the points 38. There are just as many contact points 38 as there are holes 26 in the upper contact guide plate 22, the points being so arranged that as the contact plate is moved downward, each point enters one contact point guide hole 26, the contact points protruding out into the space 34 when the contact point plate 36 is in contact with the contact guide plate.

There is also a lower contact plate 42 of the same size, material and shape as upper contact plate 36, and provided with upwardly protruding metal contact points 44 set in the plate 42 and extending upwards slidably through guide holes 27 in lower contact guide plate 24. There are just as many contact points 44 in the lower con-

tact plate as there are contact points in the upper contact plate, and they all correspond in number and arrangement to those on the key itself.

Extending leftward into the right end of the key passageway 34 as seen in Figure 1, is a plunger 46 having a slotted collar 48 in which are engaged the ends 50 and 52 of lever arms 54 and 56 which are pivoted at 58 and 50 respectively, the other legs 62 and 64 of the levers being pivotally engaged at 66 and 68 respectively with shaft members 70 and 72 secured at their inner ends 74 and 76 to springs 78 and 80, the other ends of the springs engaging and being secured to upper and lower contact carrying plates 36 and 42 respectively. It is thus apparent that as the plunger 46 is moved to the right by the insertion of the key 6 into space 34, the collar 48 causes the rocker arm levers 54 and 56 to compress the springs 78 and 80 respectively, thus moving upper and lower contact plates 36 and 42 toward each other and causing their respective contact points 38 and 44 to protrude into the key passageway 34.

Plunger 46 is biased to the left by spring 82, and carries electrically connected contact points 84, so that as the plunger 46 is pushed to the right by the key, electrical contact is made between contact terminals 86 and 88. Terminal 86 is connected by wire 90 to one of the upper contact points shown at 92, all the other upper contact points being connected together and to wire 94 which is connected to the coil 96 of a circuit breaker the other terminal of the coil being connected by wire 98 to terminal 100. Wire 102 connects from terminal 100 to the contact on movable armature 104, while the stationary contact 106 is connected by wire 108 to terminal 88. Wire 110 leads from terminal 112 to one of the lower contacts 44 denoted by 114, all the rest of the lower contacts 44 being connected together and by wire 116 to terminal 118, terminals 118, 100 and 112 being mounted on an insulating block 120.

Within the key shank, as seen in Figure 3, the upper surface contact point 93 corresponding in position to contact 92 on the upper contact point plate, is connected by wire 122 to lower surface contact 115 corresponding in position to contact 114 on the lower contact plate.

A source of electric current is connected to terminals 100 and 118, and the leads from the magnetic or solenoid type latch indicated by coil 119 to be actuated by the lock shown in Figure 1, are connected across terminals 118 and 112.

In operation, the key must be inserted with the proper side up. No master keys are possible and only the key for the particular lock will set up the correct circuit to operate the lock while simultaneously leaving the circuit breaker closed. If there is an attempt to use the wrong key, the wrong side of the key, or any attempt to pick the mechanism by shorting it out, the circuit breaker will act and prevent the lock from opening, the circuit breaker resuming the connection between the wires 102 and 108 when the short is eliminated. When the key is fully inserted, the contacts on the contact plates are firmly pressed against the contact points on both sides of the key, thus creating a path through which the current may flow and so operate the magnetic type lock 119. The terminals 36 and 88 are not connected together until the key is all the way in. As the key is inserted, it causes these contacts to be connected together, completing the circuit so that current flows through

the upper contact points through the key and lower contact points to the lock 119 to be actuated. A large number of combinations is possible by merely varying the internal connections of the key and of the upper and lower contact plates. The device may also be used as an automotive ignition switch, and as a device for actuating a horn when being tampered with by automobile thieves.

Although I have described a preferred embodiment of my invention in specific terms, it is to be understood that various changes may be made in size, shape, materials and arrangement without departing from the spirit and scope of my invention as claimed.

I claim:

1. A key operated electric switch for connecting the opposite sides of a power source to the opposite sides of a load circuit comprising a plurality of spaced apart contacts positioned for simultaneous engagement by a key and electrically insulated from each other, a switch circuit for connecting the opposite sides of the power source to the opposite sides of the load circuit and including a gap between two selected contacts, said contacts being electrically connectable by a properly coded key inserted into said key operated switch, normally closed electro-magnetic switch means interposed in said switch circuit in series with said gap and operated to open said switch circuit when energized, and an energizing circuit for said electro-magnetic switch means extending between the opposite sides of said power source and including in series said electro-magnetic switch means and a gap between two separate groups of non-selected contacts, whereby said electro-magnetic switch means will be energized to interrupt said switch circuit if any contact of one group is electrically interconnected with any contact of the other group of non-selected contacts.

2. A key operated electric switch for connecting the opposite sides of a power source to the opposite sides of a load circuit comprising a plurality of spaced apart contacts insulated from each other and positioned to be simultaneously contacted by a key, a switch circuit operative to connect one side of the power source to one side of the load circuit, the other side of the power source to one selected contact and the other side of the load circuit to another selected contact so that said power source will be operatively connected to said load circuit when said two selected contacts are electrically interconnected, a key having a plurality of contact points corresponding in relative position to the relative position of said contacts and electrically insulated from each other, means in said key electrically interconnecting two contact points respectively corresponding in position to said two selected contacts to electrically interconnect said two selected contacts when said key is properly positioned in the key operated switch, normally closed switch means interposed in said switch circuit, electro-magnetic means connected to said normally closed switch means to open the latter and interrupt said switch circuit when said electro-magnetic means is energized, and an energizing circuit for said electro-magnetic means operative to connect one side of said electro-magnetic means to one side of said power source, the other side of said electro-magnetic means to one group of non-selected contacts and another group of non-selected contacts to the other side of said power source to energize said

electro-magnetic means if any contact of said one group of non-selected contacts is electrically connected with any contact of said other group of non-selected contacts.

3. A key-operated electric switch for connecting the opposite sides of a power source to the opposite sides of a load circuit comprising a plurality of spaced apart contacts insulated from each other and positioned to be simultaneously contacted by a key, a switch circuit operative to connect one side of the power source to one side of the load circuit, the other side of the power source to one selected contact and another selected contact with the opposite side of the load circuit, a normally open, key closable switch interposed in said switch circuit, a normally closed switch interposed in said switch circuit in series with said normally open switch, electro-magnetic means connected to said normally closed switch to open the latter and interrupt said switch circuit when said electro-magnetic means is energized, an energizing circuit for said electro-magnetic means operative to connect one side of said electro-magnetic means to one side of said power source, the other side of said electro-magnetic means to at least one of the non-selected contacts and at least one other of the non-selected contacts to the other side of the power source, and a key insertable into said key operated switch to close said normally open switch and simultaneously electrically interconnect said two selected contacts without electrically interconnecting any two non-selected contacts connected to said electro-magnetic means energizing circuit.

4. A key-operated electric switch for connecting the opposite sides of a power source to the opposite sides of a load circuit comprising two sets of contacts disposed at respectively opposite sides of a key receiving space and each including a plurality of contacts electrically insulated from each other, a switch circuit operative to connect the opposite sides of the power source to the opposite sides of the load circuit and including a gap between two selected contacts, one of which is in one and the other of which is in the other of said two sets of contacts, said selected contacts being electrically interconnectible by a properly coded key inserted into said key receiving space, normally closed, electro-magnetic switch means interposed in said switch circuit in series with said gap and operative, when energized, to interrupt said switch circuit, and an energizing circuit for said electro-magnetic switch means operative to connect the opposite sides of said electro-magnetic switch means to the opposite sides of the power source and including a gap between non-selected contacts of said two sets of contacts whereby said electro-magnetic switch means is energized whenever non-selected contacts of respective sets of contacts are electrically interconnected.

5. A key-operated electric switch for electrically connecting the opposite sides of a power source to the opposite sides of a load circuit comprising two spaced apart, substantially parallel, apertured plates of electrically insulative material disposed at respectively opposite sides of a key receiving space, two contact carrying plates of electrically insulative material respectively disposed adjacent the outer sides of said apertured plates, respective sets of contacts carried by said contact carrying plates and extending through corresponding apertures in the adjacent apertured plates, a switch circuit operative to con-

nect one side of the power source to one side of the load circuit, the other side of the power source with a selected contact of one of said sets of contacts and the other side of the load circuit with a selected contact of the other set of contacts, a normally open switch interposed in said switch circuit in series with the gap between said two selected contacts, a key operated plunger extending from said normally open switch into said key receiving recess to close said normally opened switch upon insertion of a key into said recess, a coded key insertable into said recess to close said normally open switch and electrically interconnect said two selected contacts to thereby complete said switch circuit without electrically interconnecting any non-selected contact of one set with any non-selected contact of the other set of contacts, respective means electrically interconnecting the non-selected contacts of said two sets, normally closed electro-magnetic switch means interposed in said switch circuit in series with said normally opened switch and the gap between said selected contacts to interrupt said switch circuit upon energization of said electro-magnetic switch means, and an energizing circuit for said electro-magnetic switch means operative to connect one side of the power source to one side of said electro-magnetic switch means, the other side of said electro-magnetic switch means to the means electrically interconnecting the non-selected contacts of one of said sets of contacts and the means connecting the non-selected contacts of the other set of contacts to the other side of the power source to energize said electro-magnetic switch means upon electrical interconnection of any non-selected contact of one set with any non-selected contact of the other set of contacts.

6. A key operated electric switch for electrically connecting the opposite sides of a power source to the opposite sides of a load circuit comprising two spaced apart, substantially parallel, apertured plates of electrically insulative material disposed at respectively opposite sides of a key receiving space, two contact carrying plates of electrically insulative material respectively disposed adjacent the outer sides of said apertured plates, respective sets of contacts carried by said contact carrying plates and extending through corresponding apertures in the adjacent apertured plates, a switch circuit operative to connect one side of the power source to one side of the load circuit, the other side of the power source with a selected contact of one of said sets of contacts and the other side of the load circuit with a selected contact of the other set of contacts, a normally open switch interposed in said switch circuit in series with the gap between said two selected contacts, a key operated plunger extending from said normally open switch into said key receiving recess to close said normally opened switch upon insertion of a key into said recess, a coded key insertable into said recess to close said normally open switch and electrically interconnect said two selected contacts to thereby complete said switch circuit without electrically interconnecting any non-selected contact of one set with any non-selected contact of the other set of contacts, respective means electrically interconnecting the non-selected contacts of said two sets, normally closed electro-magnetic switch means interposed in said switch circuit in series with said normally opened switch and the gap between said electric contacts to interrupt said switch circuit upon energization of said electro-magnetic switch

means, and an energizing circuit for said electro-magnetic switch means operative to connect one side of the power source to one side of said electro-magnetic switch means, the other side of said electro-magnetic switch means to the means electrically interconnecting the non-selected contacts of one of said sets of contacts and the means connecting the non-selected contacts of the other set of contacts to the other side of the power source to energize said electro-magnetic switch means upon electrical interconnection of any non-selected contact of one set with any non-selected contact of the other set of contacts, and spring means interconnected respectively between said contact carrying plates and said key operated plunger to press said contacts firmly against the opposite sides of a key inserted into said key receiving space.

7. A key operated electric switch for electrically connecting the opposite sides of a power source to the opposite sides of a load circuit comprising two spaced apart, substantially parallel, apertured plates of electrically insulative material disposed at respectively opposite sides of a key receiving space, two contact carrying plates of electrically insulative material respectively disposed adjacent the outer sides of said apertured plates, respective sets of contacts carried by said contact carrying plates and extending through corresponding apertures in the adjacent apertured plates, a switch circuit operative to connect one side of the power source to one side of the load circuit, the other side of the power source with a selected contact of one of said sets of contacts and the other side of the load circuit with a selected contact of the other set of contacts, a normally open switch interposed in said switch circuit in series with the gap between said two selected contacts, a key operated plunger extending from said normally open switch into said key receiving recess to close said normally opened switch upon insertion of a key into said recess, a coded key insertable into said recess to close said normally open switch and electrically interconnect said two selected contacts to thereby complete said switch circuit without electrically interconnecting any non-selected contact of one set with any non-selected contact of the other set of contacts, respective means electrically interconnecting the non-selected contacts of said two sets, normally closed electro-magnetic switch means interposed in said switch circuit in series with said normally opened switch and the gap between said selected contacts to interrupt said switch circuit upon energization of said electro-magnetic switch means, and an energizing circuit for said electro-magnetic switch means operative to connect one side of the power source to one side of said electro-magnetic switch means, the other side of said electro-magnetic switch means to the means electrically interconnecting the non-selected contacts of one of said sets of contacts and the means connecting the non-selected contacts of the other set of contacts to the other side of the power source to energize said electro-magnetic switch means upon electrical interconnection of any non-selected contact of one set with any non-selected contact of the other set of contacts, and spring means interconnected respectively between said contact carrying plates and said key operated plunger to press said contacts firmly against the opposite sides of a key inserted into said key receiving space, said key comprising a flat body of electrically insulative material having therein two

electrically interconnected contact points respectively disposed at opposite faces of said body and corresponding in position to the position of the respective selected contacts.

8. A key operated electric switch comprising a housing, a pair of plates mounted in said housing in spaced apart, substantially parallel relationship to provide a key receiving space therebetween, each of said plates being formed of electrically insulative material and having therein a plurality of apertures arranged in a predetermined pattern, a base plate secured to one end of said housing and having therein a key receiving hole registering with the key receiving space between said plates, two contact carrying plates formed of electrically insulative material and respectively disposed adjacent the outer sides of said first mentioned plates, a plurality of contact pins secured in each of said contact carrying plates and projecting outwardly therefrom to pass through respective apertures in the adjacent apertured plates to said key receiving recess, a magnetic relay switch mounted in said housing including an electro-magnetic coil and a normally closed switch opened by said coil when the latter is energized, a group of three binding posts mounted in said housing and electrically insulated therefrom, one of said binding posts being connectable to one side of a power source, a second to the other side of the power source and to one side of a load circuit and the third binding post being connectable to the opposite side of the load circuit to supply energizing current to such load circuit when the key operated switch circuit is closed, a conductor connecting said one binding post to one side of said relay switch coil and to one side of said relay switch, a pair of spaced apart, fixed switch terminals mounted in said housing at the end of said key receiving space opposite said base plate, a key operated plunger projecting into such opposite end of said space and carrying a pair of interconnected switch terminals engageable with said fixed terminals to electrically interconnect the latter, spring means resiliently urging said plunger carried contacts away from said fixed contacts, a conductor connecting one of the contacts carried by one of said contact carrying plates with one of said fixed contacts, a conductor connecting all of the other contacts carried by the same plate with the remaining side of said relay coil, a conductor connecting one of the contacts carried by the other of said contact carrying plates to said third binding post, a conductor connecting all of the other contacts carried by said other contact carrying plate to said second binding post whereby interconnecting any one of said other contacts carried by said one contact carrying plate with any one of said other contacts carried by said other contact carrying plate will energize said relay coil and open said relay switch, and when said one contact of said one contact carrying plate is interconnected with said one contact of said other contact carrying plate without interconnecting any of said other plate carried contacts, said power source will be connected with said load circuit, and a key insertable through said base plate key hole into the space between said apertured plates to move said plunger to interconnect said fixed contacts and simultaneously connect said one contact in one of said contact carrying plates with said one contact in the other of said contact carrying

plate without interconnecting any of said other plate carried contacts, said key comprising a flat body of electrically insulative material, a plurality of contact points in each face of said body with the contact points in one face electrically insulated from the contact points in the other face, and means in said body electrically interconnecting a selected contact point in one face with a selected contact point in the other face of said body.

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