United States Patent

[11] 3,582,583

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[54] **CODED SWITCH**
20 Claims, 10 Drawing Figs.

[52] **U.S. Cl.** **200/43**
[51] **Int. Cl.** **H01h 27/10**
[50] **Field of Search** 200/43; 70/313, 314, 315

[56] **References Cited**

UNITED STATES PATENTS

2,494,015	1/1950	Tate et al.	200/43
2,594,254	4/1952	Vidalis et al.	200/43X
2,718,776	9/1955	Moore	200/43X
2,964,733	12/1960	Raju	200/43X
3,518,383	6/1970	Pupura	200/43

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ABSTRACT: A coded switch unit is provided with code setting means adjustable between two positions and a plurality of pushbutton actuated operating means also adjustable between two positions and cooperating with contact means in such a manner that depending upon the adjusted position of the code setting means and the operating means, closing of a circuit connected to the switch will require actuation of operating means set in one position, whereas actuation of any operating means set in the other position will prevent closing of the circuit.

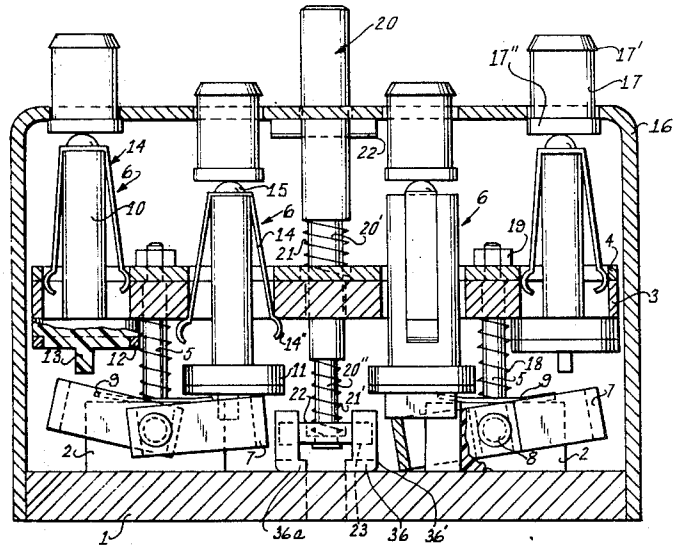


FIG. 1

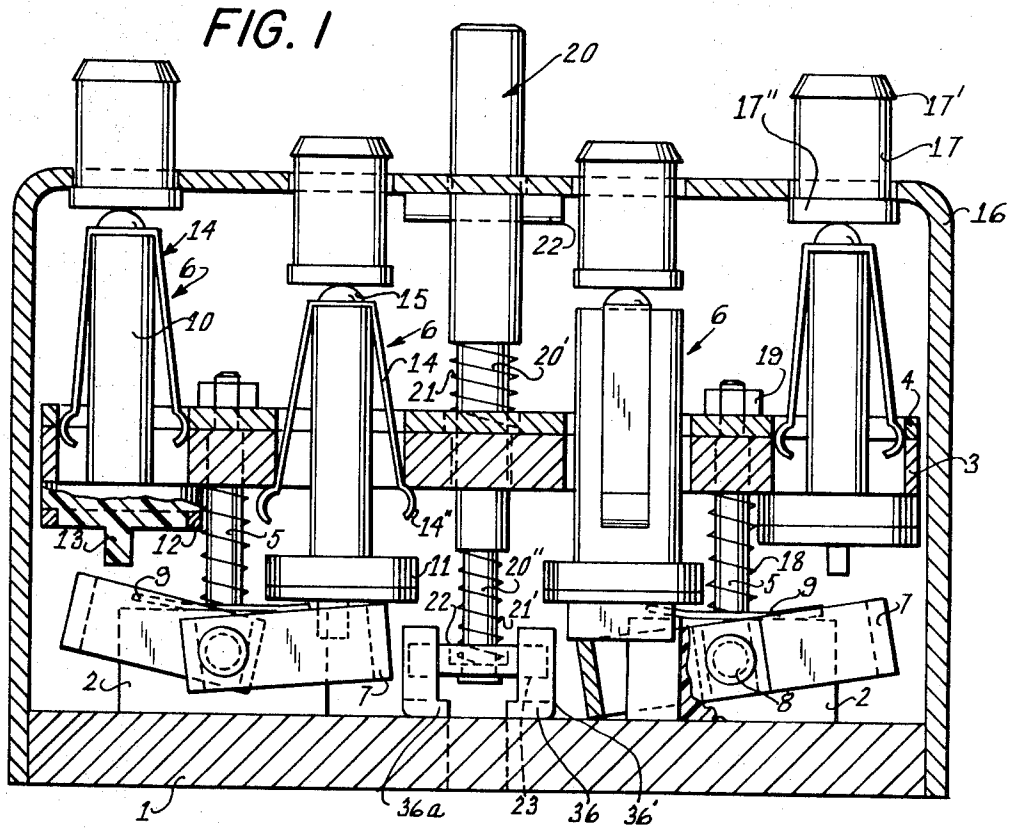
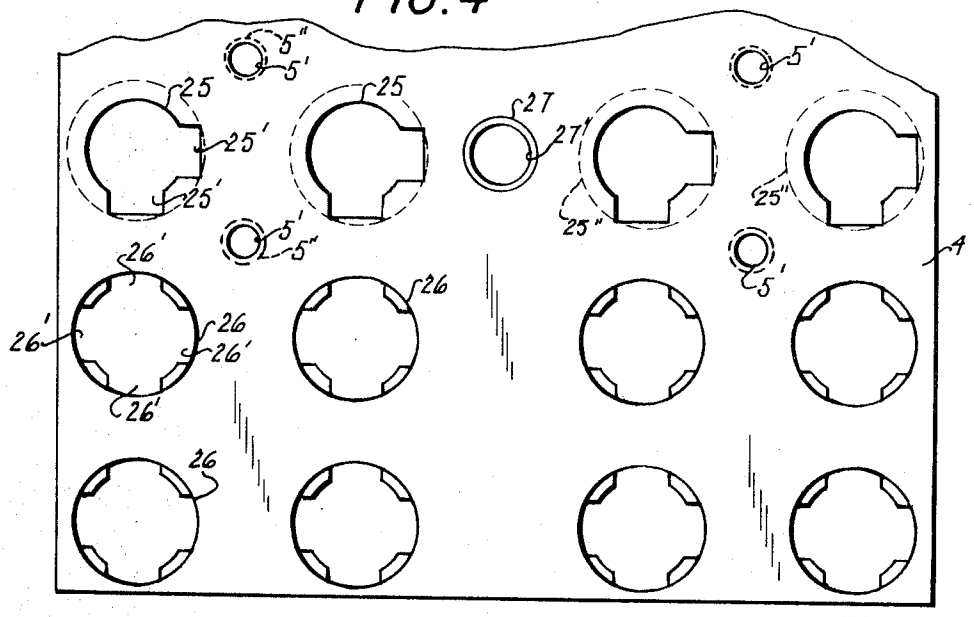


FIG. 4

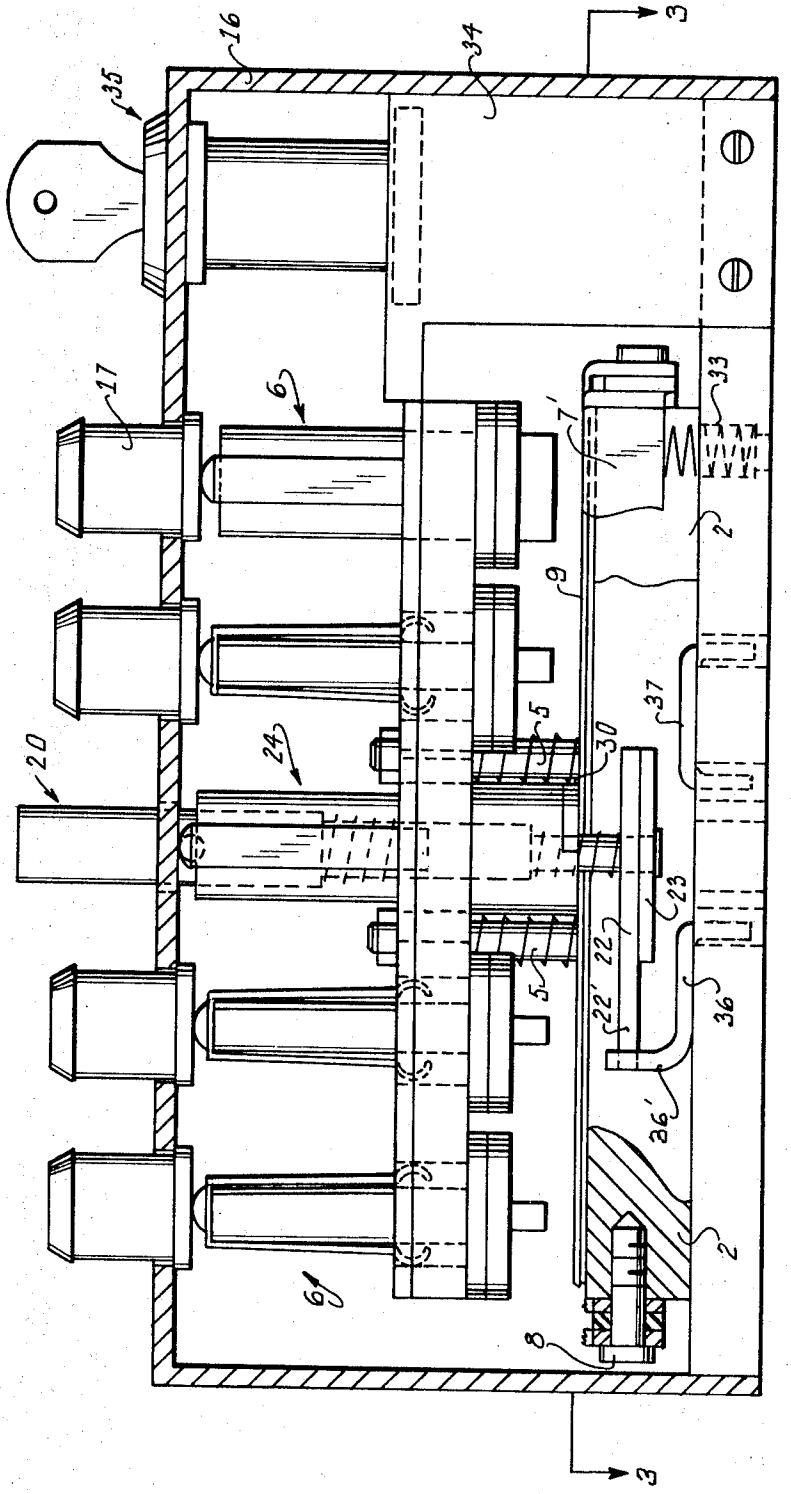


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FIG. 2



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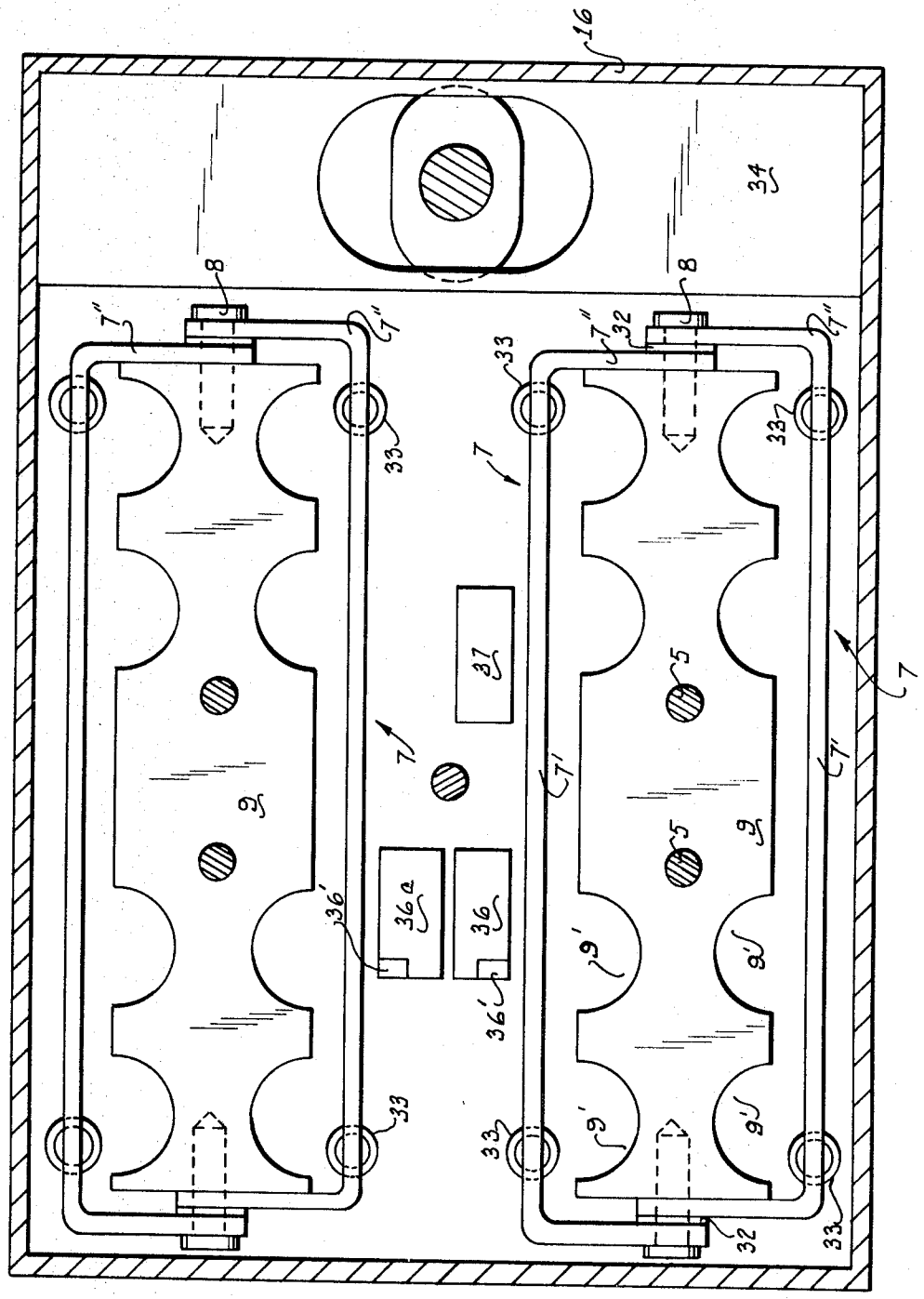


FIG.3

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FIG. 5

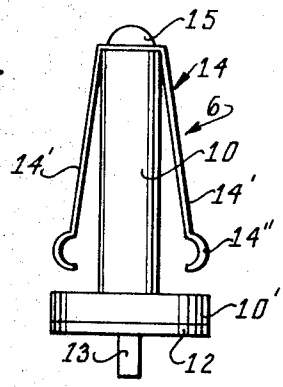


FIG. 7

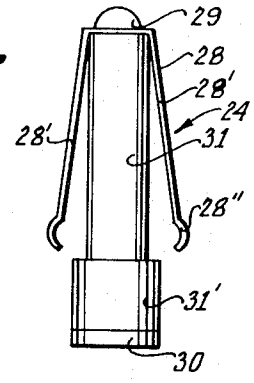


FIG. 6

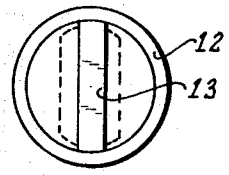


FIG. 8

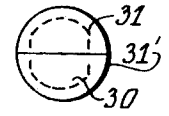
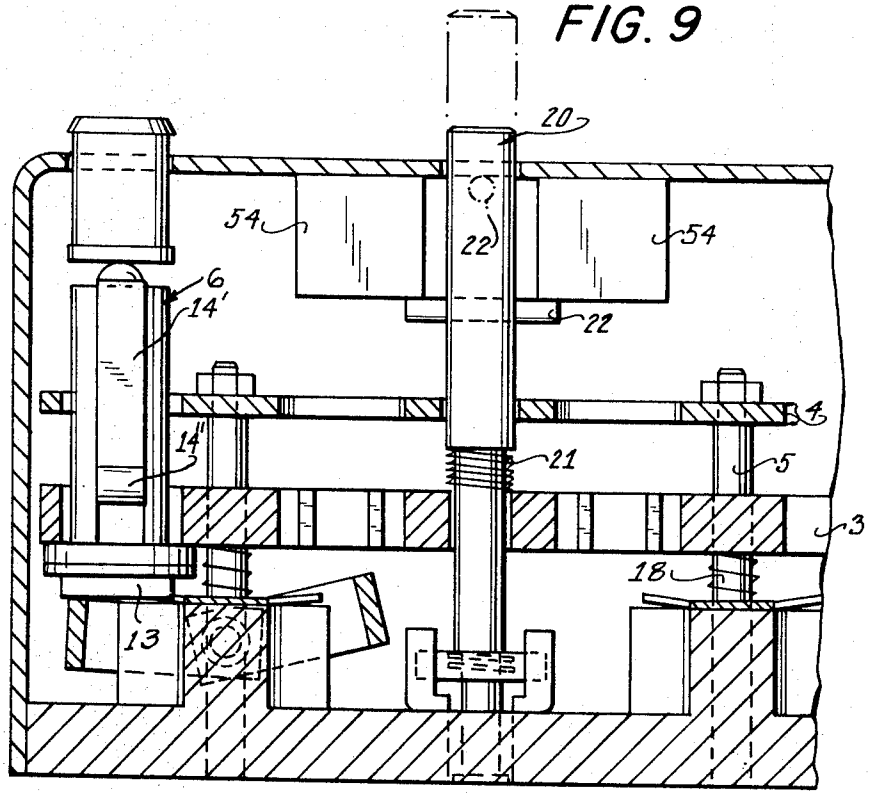


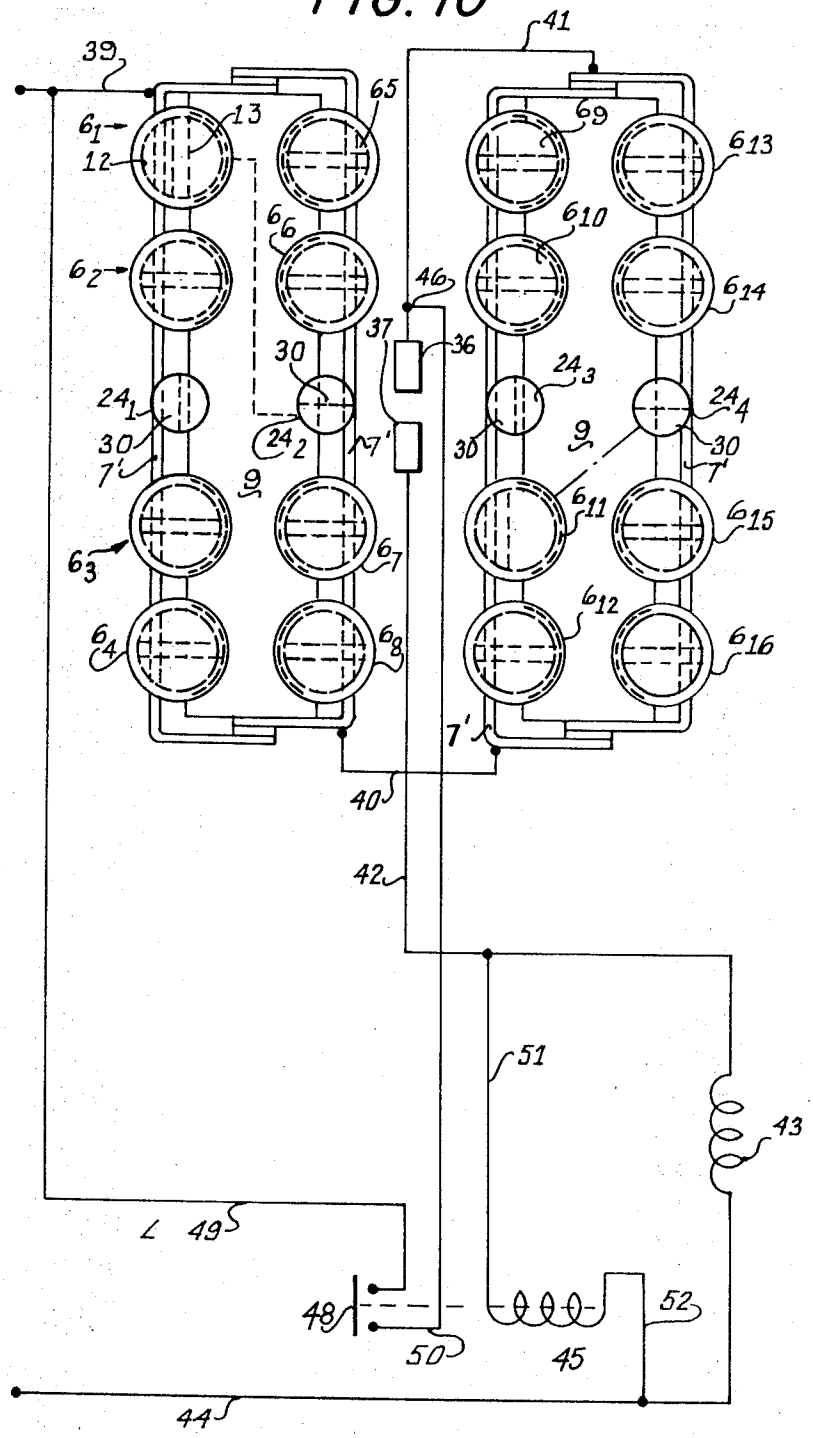
FIG. 9



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FIG. 10



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CODED SWITCH

BACKGROUND OF THE INVENTION

The present invention relates to a coded switch which has a plurality of pushbuttons accessible to the operator, which have to be operated in a certain manner to close the load circuit connected to the coded switch. The load circuit may, for instance, be a solenoid, which when energized will withdraw a lock bolt, or the load circuit may be the ignition circuit of an automotive vehicle.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide for a coded switch of the aforementioned kind provided with a plurality of pushbuttons accessible to the operator in which only certain pushbuttons have to be pushed to close the load circuit, while actuation of other pushbuttons will prevent closing of the load circuit.

It is a further object of the present invention to provide such a switch with means, not accessible to the operator, by means of which the code to which the switch is set may be varied in a great number of ways.

It is a further object of the present invention to provide for a switch of the aforementioned kind which is composed of relatively few and simple parts so that the switch can be manufactured at reasonable cost and will stand up properly under extended use.

With these objects in view, the coded switch, according to the present invention, mainly comprises support means, at least two code setting means and a plurality of operating means arranged in two groups respectively coordinated with the two code setting means, in which each of the code setting means is mounted on the support means adjustable between a contacting position and a noncontacting position and each of the operating means is mounted on the support means adjustable between a contact-making and a contact-breaking position and movable between a rest position and an active position. The switch according to the present invention comprises further means cooperating with each of the operating means for yieldably holding the same in the operating position, when moved from the rest to the operating position, and contact means including stationary contact means and a pair of contact members in circuit with a load device to be operated by the switch and movable between a first and a second position and respectively coordinated with the two code setting means and the two groups of operating means and cooperating therewith in such a manner that when one of the code setting means is in the contacting position, it will establish contact between the stationary contact means and the respective contact member when the latter is in the first position, while any operating means of the group coordinated with the one code setting means, when set in the contact-breaking position and when moved to the active position will move the respective contact member to the second position to thereby break the contact established by said one code setting means between said stationary contact means and the respective contact member, and so that when the other code setting means is in said noncontacting position, at least one of the operating means of the group coordinated with said other code setting means has to be set in said contact-making position to establish, when moved to said operating position, contact between said stationary contact means and the other movable contact member when the latter is in said first position, while any other operating means in said other group, when set to said contact-breaking position and when moved to its active position, will move the other of said contact members to said second position to thereby break the contact established by the operating means set in said contact-making position between said stationary contact means and the other contact member, whereby when one of said code setting means is set in said contacting position and the other in said noncontacting position, at least one operating means of the group coordinated with said other code setting means has to be set in said contact-making position and be moved from said rest to said active position to close the circuit while any other operating means of either group when set in said contact-breaking position and moved to said active position will prevent closing of said circuit.

Preferably, the switch according to the present invention includes also restoring means cooperating with the operating means for simultaneously moving all operating means which have been moved to the active position, back to their rest position and the restoring means may include relay means for maintaining the circuit, when closed by the operating means, in closed condition until the operating means are moved back to their rest position.

Preferably, the code setting means, the operating means and the contact means are enclosed in a housing which may be locked to prevent unauthorized access to the interior of the housing in which the aforementioned means are located, and means in the form of pushbuttons having operating portions outside of the housing cooperate with the operating means for moving the latter between the rest and the active positions thereof.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a transverse cross section through the switch, according to the present invention;

FIG. 2 is a longitudinal cross section through the switch;

FIG. 3 is a cross section taken along the line III–III of FIG. 2;

FIG. 4 is a partial top view of the switch with the cover and various elements of the switch removed;

FIG. 5 is a side view of one of the operating means of the switch;

FIG. 6 is a bottom view of the operating means shown in FIG. 5;

FIG. 7 is a side view of one of the code setting means of the switch;

FIG. 8 is a bottom view thereof;

FIG. 9 is a cross section similar to FIG. 1 with some of the elements removed for simplification reasons and showing the switch during resetting of the operating means; and

FIG. 10 is a wiring diagram of the switch according to the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the drawing and more specifically to FIGS. 1—4 of the same, it will be seen that the switch according to the present invention comprises support means including a substantially rectangular baseplate 1 and a pair of elongated bosses 2 extending transversely spaced from each other in longitudinal direction of the rectangular baseplate 1 and fixedly connected thereto or integrally made therewith. The baseplate 1 and the bosses 2 are formed from insulating material, for instance plastic. The support means include further a rectangular plate 4 mounted upwardly spaced from the baseplate 1 and the bosses 2 thereon on pins 5 which are screwed or press fitted with the lower ends thereof in corresponding bores formed in the bosses 2. The upper portions of the pins 5 have reduced diameters and the plate 4 rests on the shoulders formed between the upper and lower portions of the pins. Nuts 19 screwed at the upper threaded ends of the pins hold the plate 4 in fixed position on the aforementioned shoulders. A plate 3 of the same configuration as the plate 4 is located beneath the latter and this plate is guided on the pins 5 for movement downwardly away from the plate 4 and is normally held in the upper position, as shown in FIG. 1, by a plurality of coil springs 18 wound about the pins 5 and biased to press the

upper surface of the plate **3** against the bottom surface of the plate **4**. The plate **4** is formed with four holes **5'** therethrough through which the pins **5** respectively extend and in addition the plate is formed with four openings **25** and 16 openings **26**, of which only eight are shown in the partial FIG. **4**, but it is understood that additional eight openings **26** are arranged on the other side of the openings **25**. In addition, the plate **4** is also formed with a central opening **27**. Each of the substantially circular openings **25** is provided with two cutouts or grooves **25'** which extend 90° displaced from each other outwardly from the inner surface of the respective opening. Each of the substantially circular openings **26** is provided with four cutouts or grooves **26'** which extend 90° displaced from each other outwardly from the inner surface of the opening. The plate **3** is formed with the same openings **26** as the plate **4** and the openings **26** in plates **3** and **4** are aligned with each other. The openings **25''** in plate **3**, which are aligned with the openings **25**, however, have a larger diameter than the openings **25**. The openings **5''** through the plate **3** aligned with the openings **5'** through the plate **4** have a large diameter, since the larger diameter portion of the pin **5** extends therethrough, whereas the opening **27'** through the plate **3** aligned with the opening **27** through the plate **4** has a smaller diameter than the opening **27**. Code setting means **24** are respectively located in the opening **25** and each of the code setting means comprises, as best shown in FIGS. **7** and **8**, an elongated pin **31** having an enlarged diameter portion **31'** at the lower end which carries in a corresponding cutout at the bottom end thereof a semicircular contact portion **30** formed of conductive material, whereas the pin **31, 31'** is formed from insulating material. A substantially U-shaped spring **28** is fastened at its transverse upper portion by the head **29** of a screw to the top end of the pin **31**, whereas the two spring arms **28'** extend along flattened side faces of the pin portion **31**, and these arms have lower slightly outwardly curved ends **28''**. The code setting means **24** respectively extend through the openings **25** formed in the plate **4** and the aligned opening formed in the plate **3** in such a manner that one of the spring arms **28** is located in the respective cutout **25'**, whereas the other spring arm is located between the flattened longitudinal side face of the pin portion **31** and the corresponding portion of the inner surface of the opening **25**. Each of the code setting means **24** may therefore be set in the plates **3** and **4** between two 90° displaced positions, one forming, as will be explained later on, a contacting position and the other a non-contacting position.

A plurality of operating means in the form of second pins **6**, as best shown in FIGS. **5** and **6**, respectively extend through the openings **26** formed in the plates **3** and **4**. Each of the operating means comprises a pin **10** have a lower portion **10'** of enlarged diameter and carrying in an annular cutout a contact ring **12** of conductive material, whereas the pin portions **10** and **10'** are formed from insulating material. A projection in the form of a narrow rib **13** projects downwardly from the bottom face of the pin portion **10** for a purpose as will be described later on, and this projection **13** is integral with the remainder of the pin and is likewise formed from insulating material. A substantially U-shaped spring **14** is fastened at its upper transverse portion by the head **15** of a screw or rivet to the upper end of the pin **10**, and the spring **14** has a pair of spring arms **14'** respectively extending along the pin portion **10** and having outwardly curved free ends **14''**. The operating means **6** respectively extend through the openings **26** formed in the plates **3** and **4** in such a manner that the spring arms **14'** are respectively located in a pair of opposite cutouts **26'**. By pressing the spring arms **14'** inwardly, each of the operating means may be turned in the respective opening **26** between two 90° displaced positions one of which is, as will be explained later on in detail, a contact-making and the other of which is a contact-breaking position. The operating means **6** are also movable in longitudinal direction in the respective openings **26** between an upper rest position and a lower active position, in the manner as will be explained later on.

The switch includes further contact means comprising a pair of stationary contact means **9** in the form of sheet metal members, for instance of copper, fastened to the upper surface of the bosses **2**, for instance by appropriate shoulders of the pins **5** and being respectively formed with semicircular cutouts **9'** (FIG. **3**), respectively aligned with the operating means **6**. Each of the semicircular cutouts **9'** has a diameter slightly smaller than the outer diameter of the contact rings **12** at the bottom ends of the operating means **6**, so that when the latter are moved from the upper rest position in downward direction to their active position, the annular contact portion **12** will engage the respective stationary contact means **9**. The diameters of the semicircular cutouts **9'** are however larger than the lengths of the projections **13** on the operating means **6** so that the stationary contact means **9** will not interfere with the projections **13** when the operating means are moved to their active position. The bosses **2** are also formed with cutouts corresponding to the cutouts **9'** in the stationary contact means and aligned therewith. The contact means of the switch comprise also for each boss **2** a pair of movable contact members **7** of substantially U-shaped configuration having each a long arm or connecting portion **7'** extending longitudinally along the respective opposite sides of the bosses **2** and a pair of short arms **7''** substantially normal to the long arms **7'** and pivotally connected by pivot pins **8** of insulating material at the free ends thereof to opposite end faces of the bosses **2**. The U-shaped, tiltably mounted contact members **7** are formed from conductive material, for instance copper, and the overlapping ends of the pairs of contact members **7** are insulated from each other by washers **32** of insulating material. The metal sheets **9** forming the stationary contact means are preferably slightly curved in transverse direction, as best shown in FIG. **1**, so that the bottom faces of the sheets **9** along the outer edges thereof are slightly upwardly spaced from the top faces of the bosses **2**. The U-shaped contact members **7** are each engaged at longitudinally spaced portions of the connecting arms **7'** by coil springs **33** which normally maintain the U-shaped contact members in slightly upwardly tilted position so that the upper edge faces of the portions **7'** thereof are maintained at the level of the outer edges of the sheets **9** or slightly above the same.

The code-setting means **24**, the operating means **6** and the contact means **7** and **9** are completely enclosed in a housing **16** which is lockable to a bracket **34** fixed to the base **1** by means of a key and lock mechanism **35** of known construction, as schematically indicated in FIG. **2**.

In order to operate the operating means, that is to move the same from the upper rest position thereof to the lower active position, a plurality of pushbuttons **17** are provided which are respectively aligned with the operating means **6** and which respectively extend through openings in the top wall of the housing **16** as clearly shown in FIGS. **1** and **2**. Each of the pushbuttons **17** is provided with an upper and a lower enlarged diameter portion **17'**, respectively **17''** which limit upward and downward movement of the respective pushbutton and which will prevent removal of the pushbuttons from the housing **16**. It is pointed out that the pushbuttons **17** are only aligned respectively with the operating means **6**, but no pushbuttons are provided for the code-setting means **24**.

The switch according to the present invention preferably also includes restoring means for simultaneously moving all operating means **6**, which have been moved from their upper rest position to their lower active position, back to their rest position. These restoring means include an elongated pin **20** extending through a central opening in the top wall of the housing **16** and with a reduced diameter portion **20'** through the openings **27** and **27'** respectively formed in the plates **4** and **3**. A coiled compression spring **21** is wound about the pin portion **20'** abutting with its upper end against the shoulder formed between the large-diameter portion of the pin and the pin portion **20'** and with its lower end on the upper surface of the plate **3** so as to urge the pin **20** in upward direction. A cross pin **22** extending through a transverse bore of the pin **20**

and normally abutting against the bottom face of the top wall of the housing **16** limits outward movement of the pin **20** under the force of the compression spring **21**. The pin **20** has a further reduced coaxial diameter portion **20''** projecting downwardly from the lower end of the pin portion **20'** and the pin portion **20''** carries axially movable at its lower end a final closing switch connected to the circuit of the switch as will be described later on. The final closing switch comprises a substantially rectangular plate **22** of insulating material having at one side a projecting tongue **22'** and carrying in a longitudinally extending cutout a contact strip **23** of conductive material adapted to make contact with contact portions **36** and **37** fastened to the baseplate **1** in any convenient manner and connected into the circuit as will be described later on in detail. The tongue **22'** extends between a pair of upward projecting arms **36'** respectively integrally formed with the contact portion **36** and a similar member **36***a* so as to maintain the contact strip **23** parallel to the longitudinal plane of symmetry of the coded switch. A coil compression spring **21'** wound about the pin portion **20''** and abutting with its upper end against the shoulder formed at the lower end of the pin portion **20'** and with its lower end against the upper surface of the plate **22** yieldably maintains the plate **22** and the contact strip **23** thereon against the peened over lower end of the pin portion **20''**.

The operation of the switch will now be described, especially with reference to the wiring diagram shown in FIG. **10**.

As mentioned above, each of the code-setting means **24** is adjustable between a contacting position and a noncontacting position 90° displaced from the contacting position by locating one of the spring arms **28'** of the code-setting means **24** in the respective slot **25'** formed in the plates **3** and **4**. Likewise, each of the operating means **6** is adjustable between a contact-making and a contact-breaking position 90° displaced from the contact-making position by locating the opposite spring arms **14'** of the operating means **6** in one or the other pair opposite slots **26'** of the plates **3** and **4**. In the diagram of FIG. **10** each of the code-setting means **24** is provided with a suffix and the four code-setting means are designated 24_1—24_4 and each of the operating means **6** is likewise provided with a suffix and respectively designated in FIG. **10** as 6_1—6_{16}. As shown in FIG. **10**, the code-setting means 24_2 and 24_4 are adjusted in their contacting position in which their contact portions **30** will respectively establish contact between the stationary contact means **9** and the respective long arms **7'** of the tiltable contact members **7**, when the latter are in the upper tilted position, that is when the long arms **7'** are pressed by the springs **33** against the bottom face of the contact pieces **30** of the thus adjusted code-setting means 24_2 and 24_4. The code-setting means 24_1 and 24_3 are however set in the noncontacting positions, that is their contact portions **30** will only engage the respective arms **7'** of the contact members when the latter are in their upward tilted position.

From the operating means of the left unit, shown in FIG. **10**, only the operating means 6_1 is shown in the contact-making position, in which the downwardly extending projection **13** thereof extends parallel to the long arm **7'** of the respective contact member **7**, whereas the operating means 6_2—6_8 are all set in their contact-breaking position in which the lower projection **13** of the respective operating means extends transverse to and over the respective arm **7'**. Of the operating means of the right unit, shown in FIG. **10**, only the operating means 6_{11} is set in the contact-making position, whereas the operating means 6_9, 6_{10}, and 6_{12}—6_{16} are all set in the aforementioned contact-breaking position. Evidently, each of the code-setting means **24** and each of the operating means **6** could be set in a 90° reversed position to change the code of the switch, but whenever one of the code-setting means **24** is set in its noncontacting position, at least one of the operating means cooperating with the same arm **7'** as the respective code-setting means has to be set in its contact-making position and whenever one of the code-setting means is set in its contacting position, all the operating means cooperating with the same arm **7'** of the respective code-setting means should be set in the contact-breaking position to assure proper operation of the coded switch.

As shown in FIG. **10**, the outer contact member **7'** of the left unit, as viewed in FIG. **10**, is connected by a conductor **39** to one pole of a current supply, the inner contact member **7'** of the left unit is connected by a conductor **40** to the inner contact member **7'** of the right unit and the outer contact member **7'** of the right unit is connected by a conductor **41** to one contact member **36** of the final closing switch. The opposite contact piece **37** of the final closing switch is connected by a conductor **42** to the load **43** which may for instance be a solenoid operating a lock when energized or which may be the ignition circuit of an automotive vehicle, and the load **43** is connected by a conductor **44** to the other pole of the current supply. Preferably, the switch includes also a holding relay **45** connected by conductors **51** and **52** respectively to the conductors **42** and **44** which when energized closes the holding switch **48** connected by conductors **49** and **50** to the conductors **39** and **41**.

Assuming the code-setting means **24** and the operating means **6** are set in their adjusted positions as shown in the diagram of FIG. **10**, then in order to close the load circuit the operator has to push only the pushbuttons **17** aligned with the operating means 6_1 and 6_{11} downwardly so as to move these two operating means from their upper rest position downwardly to their lower active position in which the contact rings **12** thereof will make contact between the arms **7'** of the respective tiltable contact member **7** and the respective stationary contact means **9**. When moved downwardly from the upper rest position to the lower active position, the respective operating means **6** will stay in the lower active position, since in their lower active position the outwardly curved ends **14''** of the spring arms **14'** of the respective operating means **6** will abut against the bottom face of the plate **3**, as shown for the second operating means **6** from the left, as viewed in FIG. **1**. Assuming only the two operating means 6_1 and 6_{11} have been moved downwardly from their upper rest to their lower active position, current will flow from the conductor **39** to the outer arm **7'** of the left unit, through the contact ring **12** of the operating means 6_1 to the stationary contact means **9** of the left unit and through this contact means **9** to the contact portion **30** of the code-setting means 24_2, as indicated by the dash-dotted line, through this contact portion **30** to the inner arm **7'** of the left unit and from there through the conductor **40** to the inner arm **7'** of the right unit, through the contact ring **12** of the operating means 6_{11}, to the stationary contact means **9** of the right unit and through the same, as indicated by the dash-dotted line, to the contact portion **30** of the code-setting means 24_4, to the outer arm **7'** of the right unit and through the conductor **41** to the contact piece **36** of the final closing switch. In order to close the load circuit, the operator has then to press downwardly on the pin **20** so that the contact strip **23** on plate **22** will establish contact between the opposite contact pieces **37** and **36** and current will then flow through the conductor **42** to the load **43** and through the conductor **44** to the other pole of the current supply so that the load circuit is closed. At the same time current will also flow through conductor **51**, holding coil **45** and conductor **52**, to energize coil **45** and thereby close the switch **48**. A further downward movement of the pin **20** will lead to a compression of the coil spring **21** so that the force of this compressed spring will overcome the upward thrust of the springs **18** and move the plate **3** downwardly away from the stationary plate **4** as shown in FIG. **9**. During such downward movement of the plate **3** the spring arms **14'** of each operating means **6**, which has been moved from its upper rest position to its lower active position, will be pressed inwardly so that the curved lower ends **14''** of these spring arms will tightly engage the inner surface of the respective slots **26'** formed in the openings in the plate **3**, as shown in FIG. **9**, and at the same time, all of the operating means which have not been pushed downwardly by the pushbuttons **17** respectively aligned therewith will be en-

gaged at their enlarged diameter portion 10' by the bottom face of plate 3 to move with the latter in downward direction and will ultimately open the circuit established by the contact members due to the engagement of the projections 13 with the outer arms 7' of the movable contact members. However, this will not interrupt the load circuit since before tilting of the movable contact members occurs, the final closing switch will have energized the holding coil 45 to close switch 48 to thus maintain the load circuit in closed condition. To maintain the load circuit closed, the operator will turn the pin 20 through 90° so that the cross pin 22 will engage bottom faces of block 54 fastened to the cover 16, so that the contact strip 23 is maintained in contact with contact portions 36 and 37 of the holding circuit. The code setting pins 24, however, do not move axially with the plate 3, since the openings 25'' in plate 3 have a diameter larger than that of the portion 31' of the pins 24.

Since all operating means 6 have thus been moved to their lower position, that is to the same level as the operating means 6_1 and 6_{11} which have been moved downwardly by the pushbuttons respectively aligned therewith, the other pushbuttons will also slide downwardly, so that subsequent thereto it can no longer be ascertained which of the pushbuttons have been operated to close the load circuit, since all of the pushbuttons will now be in their lower position, whereby the code setting can not be ascertained by the position of the pushbuttons.

To open the load circuit, pin 20 is again rotated through 90° to disengage the cross pin 22 from the block 54, whereafter the pin is released so as to move under the influence of the spring 21 to its upper position, indicated in dotted lines in FIG. 9, at which the cross pin 22 will engage the bottom face of the top wall of the cover 16. In this upper position of the pin 20, the plate 22 and the contact strip 23 thereon will move to the position as shown in FIG. 1 to thereby open the load circuit. At the same time, as spring 21 expands, the downward pressure exerted thereby on plate 3 will be overcome by the compressed springs 18 so that plate 3 will be moved by the latter upwardly until its top face engages the bottom face of the stationary plate 4. Upward movement of plate 3 will also move all of the operating means 6 and the pushbuttons 17 aligned therewith back to the rest position, as shown in FIG. 1, due to the engagement of the curved outer ends 14'' on the spring arms 14' with face portions of the slots in plate 3.

If an unauthorized person, not familiar with the code to which a switch is set, presses one of the pushbuttons 17 which is aligned with an operating means 6 set in the contact-breaking position, for instance the operating means 10, the downwardly extending projection 13 thereon which extends transverse and over the respective arm 7' of the tiltable contact member 7, will tilt the latter from its upwardly inclined position to the downwardly inclined position, as for instance shown for the left arm of the right unit, as viewed in FIG. 1. This downwardly tilting of the left arm 7' of the right unit, as viewed in FIG. 10 will prevent closing of the load circuit even if the operating means 6_{11} is moved from its upper rest position to the active position, since during such movement of the operating means 6_{11} the contact ring 12 thereof will make only contact with the stationary contact means 9 but will remain out of contact with the downwardly tilted arm 7'.

As mentioned above, each of the code-setting means 24 and each of the operating means 6 may be adjusted in two through 90° displaced positions so that the code of the switch may be changed. Since the code-setting means and the operating means are enclosed in a locked housing, the code to which the switch is set cannot be observed by an unauthorized person.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of coded switches differing from the types described above.

While the invention has been illustrated and described as embodied in a coded switch provided with code-setting means and operating means each of which may be set into two adjusted positions to vary the code of the switch, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What I claim as new and desired to be protected by Letters Patent is set forth in the appended claims.

1. A coded switch unit comprising, in combination, support means; at least two code-setting means and a plurality of operating means arranged in two groups respectively coordinated with the two code-setting means, each of said code-setting means being mounted on said support means adjustable between a contacting position and a noncontacting position and each of said operating means being mounted on said support means adjustable between a contact-making and a contact-breaking position and movable between a rest position and an active position; means cooperating with each of said operating means for yieldably holding the same in said operating position, when moved from said rest position to said operating position; and contact means mounted on said support means and including stationary contact means and a pair of contact members in circuit with a load device to be operated by said switch and movable between a first and a second position and respectively coordinated with said two code-setting means and said two groups of operating means and cooperating therewith in such a manner so that when one of said code-setting means is in said contact position it will establish contact between said stationary contact means and the respective contact member when the latter is in said first position, while any operating means of the group coordinated with said one code-setting means, when set in said contact-breaking position and when moved to said active position will move the respective contact member to said second position to thereby break the contact established by said one code-setting means between said stationary contact means and the respective contact members and so that when the other code-setting means is in said noncontacting position, at least one of the operating means of the group coordinated with said other code-setting means has to be set in said contact-making position to establish, when moved to said operating position, contact between said stationary contact means and the other movable contact member when the latter is in said first position, while any other operating means in said other group, when set to said contact-breaking position, and when moved to its active position, will move the other of said contact members to said second position to thereby break the contact established by the operating means set in said contact-making position between said stationary contact means and said other contact member, whereby when one of said code-setting means is set in said contacting position and the other in said noncontacting position at least one operating means of the group coordinated with said other code-setting means has to be set in said contact-making position and be moved from said rest to said active position to close the circuit, while any other operating means of either group when set in said contact-breaking position and moved to said active position will prevent closing of said circuit.

2. A coded switch as defined in claim 1, wherein two coded switch units are mounted on a common support means, and wherein one movable contact member of one unit is connected in series with one movable contact member of the other unit, the other movable contact member of one unit being connected in circuit with said device.

3. A coded switch as defined in claim 1, and including housing means covering said code-setting means, said operating means and said contact means, and moving means having operating portions outside said housing and being mounted in

the latter between an extended and a depressed position to cooperate with said operating means to move the latter from said rest to said active position when the respective moving means is moved to its depressed position.

4. A coded switch as defined in claim 3, and including restoring means movable between a first and a second position and cooperating during its movement from said first to said second position with the operating means which have not been moved to the active position thereof by said moving means to move said operating means also to said active position and to thereby cause movement of all of said moving means to said depressed position and for moving during the movement of the restoring means from said second to said first position all of the operating means to said rest position and all of said moving means to said extended position, and relay means for maintaining the circuit, when closed by said operating means, in closed condition while all of said operating means are moved by said restoring means to said active position.

5. A coded switch as defined in claim 1, wherein said operating means are mounted on said support means movable in substantially vertical direction from an upper rest position to a lower active position, and wherein said movable contact members are mounted in said support means in such a manner that portions thereof cooperating with said code-setting means and said operating means are in said first position of said members at a higher elevation than in the second position, and including biasing means cooperating with said movable contact members for yieldably holding the latter in said first position.

6. A coded switch as defined in claim 5, wherein said stationary contact means comprise an elongated conductive member and wherein said movable contact members comprise a pair of substantially U-shaped members having each a pair of short arm portions pivotally mounted at one end thereof insulated from each other on said support means and an elongated connecting portion integrally connected to the other ends of said arms and extending substantially parallel to said elongated conductive member, the connecting portions of said pair of U-shaped members being respectively located at opposite sides of said stationary conductive member and spaced therefrom.

7. A coded switch as defined in claim 6, wherein each of said code-setting means is formed by a first pin and each of said operating means is formed by a second pin of a different configuration than said first pin.

8. A coded switch as defined in claim 7, wherein each of said pins is adjustably mounted on said support means in two through-90°-displaced positions.

9. A coded switch as defined in claim 8, wherein each of said pins is formed from insulating material, wherein each of the first pins forming said code-setting means is provided at the bottom end thereof facing said contact means with a contact portion of conductive material arranged in such a manner that said contact portion engages only said connecting portion of said movable contact member when said first pin is in said noncontacting position and so that said contact portion makes contact between said stationary contact member and the connecting portion of the respectively movable contact member when said first pin is in said contact position, and wherein each of said second pins forming said operating means is provided at the bottom end thereof facing said contact means with a contact ring of conductive material arranged to make contact with said stationary contact member and the connecting portion of the respective movable contact member, when the latter is in said first position and the respective second pin is set in said contact making position and moved from its rest to its active position, and each of said second pins is provided at the bottom face thereof with a downwardly extending projection of insulating material extending beyond the bottom face of said contact ring and arranged in such a manner so that, when the respective second pin is set in its contact-breaking position and is moved from said rest to said active position, said projection will engage the connecting portion of the respective movable contact member to move the latter from its first to its second position.

10. A coded switch as defined in claim 9, wherein said support means comprises base means of insulating material on which said contact means are mounted and a plate upwardly spaced from said base means and formed with a plurality of openings in which said first pins are mounted adjustable between said contacting and said noncontacting positions and in which said second pins are mounted adjustable between said contact-making and said contact-breaking positions and movable between said rest and said active position.

11. A coded switch as defined in claim 10, and including cooperating means on said plate and said pins for maintaining the latter in respective adjusted positions.

12. A coded switch as defined in claim 10, wherein each of said openings for said second pins is of substantially circular cross section and provided with four radially outwardly extending cutouts displaced through 90° from each other and including leaf-spring means fastened to each of said second pins and having outwardly spread arms located in diametrically opposite cutouts for maintaining said second pins in the respective adjusted position.

13. A coded switch as defined in claim 10, wherein each of said openings for said first pins is of substantially circular cross section and provided with two radially outwardly extending cutouts displaced through 90° from each other and including leaf-spring means fastened to each of said first pins and having at least one outwardly spread arm located in one of said cutouts for maintaining said first pins in the respective adjusted position.

14. A coded switch as defined in claim 12. wherein said means for yieldably holding each of said operating means in said active position are constituted by outwardly bulging portions on said spring arms abutting against the bottom face of said plate when said second pins are moved to said active position.

15. A coded switch as defined in claim 14. wherein said plate is connected to said base means movable between an upper position and a lower position in which said plate is closer to said base means than in said upper position and in which said outwardly bulging portions on said spring arms are located in compressed condition in said cutouts so that by moving said plate from said upper said lower and back to said upper position, any of said second pins which have been moved to the active position will be moved back to the rest position, and biasing means cooperating with said plate for yieldably maintaining the same in said upper position.

16. A coded switch as defined in claim 15, and including means connected to said plate for moving the latter against said biasing means from said upper to said lower position, each of said operating means having an enlarged diameter portion located beneath said plate so that all of said operating means are moved to said active position during movement of said plate to said lower position, and including normally open switch means in said circuit which are moved to a closed position during movement of said plate to said lower position and holding relay means in said circuit cooperating with said switch means for maintaining said circuit, when closed by said operating means, in closed condition, when all of said operating means are moved by said plate to said active position.

17. A coded switch as defined in claim 16, and including a housing removably connected to said base means and having a top wall extending substantially parallel to said plate upwardly spaced from the upper ends of said pins and a plurality of pushbuttons slidably guided in openings of said top wall for movement between an extended and a depressed position and being respectively aligned with said second pins.

18. A coded switch as defined in claim 17, wherein said means for moving said plate from said upper to said lower position comprises a pin member extending through an opening in said top wall of said housing and an aligned opening in said plate so as to be movable in substantially vertical direction and resiliently compressible means between said pin member and said plate for moving the latter to said lower position during downward movement of said pin member, said normally open switch means being connected to the lower end

of said pin member to be moved to the closed position before said plate is moved to its lower position.

19. A coded switch as defined in claim **18**, wherein said pin member is also turnable about its axes and including cooperating means on said pin member and on said top wall of said housing for maintaining said pin member after depression and turning about its axis in the depressed position and said normally open switch in closed position.

20. A coded switch as defined in claim **19**, and including locking means for locking said housing to said base means.