April 26, 1960 L. GORAL 2,934,615

COMBINATION LOCK SWITCH

Filed March 21, 1956

FIG. 1

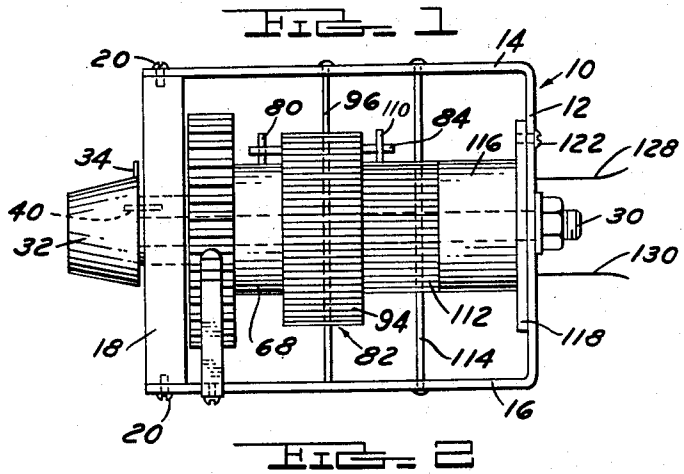


FIG. 2

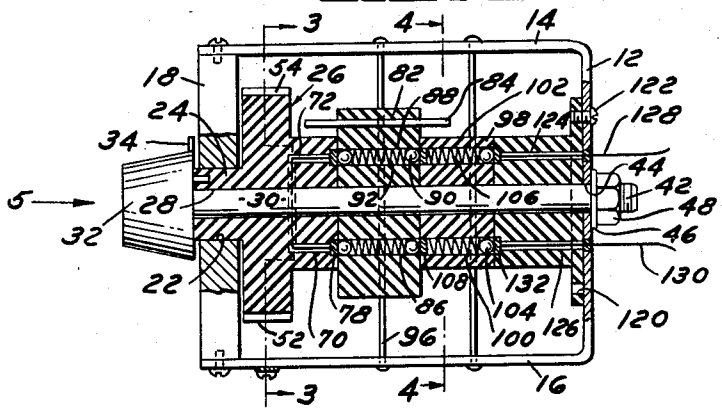


FIG. 3

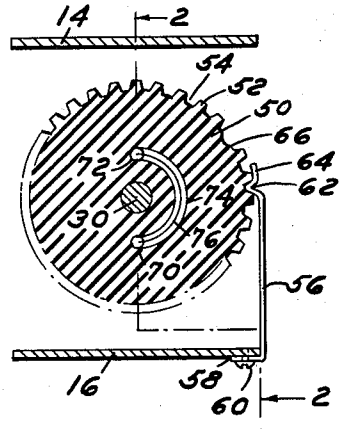


FIG. 4

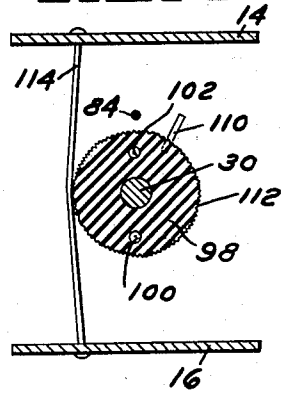
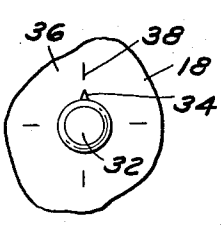


FIG. 5



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United States Patent Office 2,934,615 Patented Apr. 26, 1960

2,934,615

COMBINATION LOCK SWITCH

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Application March 21, 1956, Serial No. 572,982

12 Claims. (Cl. 200—43)

This invention relates to a new and improved combination lock switch, and, more particularly, to a combination lock switch which is capable of being set to complete an electrical circuit by counting the number of clicks made by the lock mechanism when it is operated.

The primary object of the present invention is to provide a combination lock switch for completing an electrical circuit for various devices, as, for example, the ignition circuit in an automotive vehicle, a circuit for an electrical appliance, and other similar electrical circuits. The device of the present invention is adapted to do away with the need for locks for the aforementioned circuits which require the use of keys for the operation thereof. The combination lock of the present invention provides a means for locking appliances and utilities which heretofore have not been subject to such locking control, for example, it is possible with the instant combination lock switch to prohibit use of a telephone, a television set, a radio, and other like devices, by incorporating the switch in the power circuit of said devices. The aforegoing locking of the power circuits of certain devices can be carried out by the combination lock switch of the present invention in a safe and fool-proof manner, and, since the structure of the instant lock is very compact, the use of the lock for such purposes will not be obvious to the average person.

It is another object of this invention to provide a means for locking an electrically operated device by closing the control circuit of the device by means of a combination lock structure which includes means for aligning a plurality of conductors which, when in alignment, will close the circuit for use.

It is still another object of this invention to provide a combination lock and switch which includes a plurality of rotors mounted on a single shaft, and, with the rotors being provided with conductive elements which, when aligned, will complete an electrical circuit, and, wherein the rotors are actuated for aligning said conductive elements by means of a single control knob which is adapted to be positioned by counting the number of clicks which a mechanism makes when the knob is rotated.

It is a further object of this invention to provide a combination lock switch for an electrical circuit which is compact and rugged in construction, economical of manufacture, and efficient in operation.

Other objects, features and advantages of this invention will be apparent from the following detailed description and appended claims, reference being had to the accompanying drawing forming a part of the specification wherein like reference numerals designate corresponding parts of the several views.

In the drawings:

Fig. 1 is an elevational side view of a combination lock switch made in accordance with the principles of the present invention;

Fig. 2 is an elevational sectional view of the illustrative embodiment, taken along the lines 2—2 of Fig. 3;

Fig. 3 is an elevational sectional view of the structure

illustrated in Fig. 2, taken along the line 3—3 thereof;

Fig. 4 is an elevational sectional view of the structure illustrated in Fig. 2, taken along the line 4—4 thereof; and,

Fig. 5 is a fragmentary front view of the structure illustrated in Fig. 2, taken in the direction of the arrow marked 5.

Referring now to the drawings, and, more particularly to Figs. 1 and 2. The illustrative embodiment comprises a housing, generally indicated by the reference numeral 10, which includes a back wall 12 to which is integrally formed a pair of forwardly extended top and bottom walls 14 and 16, respectively. The top, bottom and back walls may be formed from any suitable material. The housing is enclosed on the front side thereof by a wall 18 which is fixed to the top wall 14 and the bottom wall 16, by any suitable means, as by the screws 20.

The front wall 18 is provided with an aperture therethrough, as 22, in which is rotatably mounted the forwardly extending stub shaft 24 which is integral with the first or front rotor, generally indicated by the numeral 26. The rotor 26 is made from any suitable dielectric material or non-conducting material. The rotor 26 is provided with an axial aperture therethrough, as 28, which is adapted to receive an elongated rod shaft 30. A control knob 32 is integrally mounted on the front end of the shaft 30 and is provided with a pointer 34. The front side of the front wall 18 is provided with a dial face 36 which has four evenly spaced indicating lines 38, which mark suitable starting points for the combination of the lock. The control knob 32 is fixed relative to the stub shaft 24 by any suitable means, as by the lock pin 40 which is fixed in the knob 32 and is adapted to be press fitted into a suitable aperture in the stub shaft 24. The rear end of the rod shaft 30 is threaded, as indicated by the numeral 42. The shaft 30 is adapted to be rotatably mounted through an aperture 44 in the back wall 12. The shaft 30 is retained in place relative to the housing 10 by means of the washer 46 and the nut 48 which is threaded on the end of the shaft 30.

The front rotor 26 is provided with an enlarged annular portion 50 which has formed on the periphery thereof a plurality of gear-like teeth 52. It is preferable that the number of the teeth 52 be uneven, whereby, the combination for the lock can be started from any position of the face of the dial 36. The rotor portion 50 is provided with the notches 54 between the teeth 52. A spring-like arm 56, made from any suitable resilient material, is provided with a lower bent end 58 which is adapted to be affixed to the bottom wall 16 by any suitable means, as by the screw 60. The other end of the arm 56 is bent inwardly and outwardly to form a V-shaped projection 62 which is adapted to engage in the notches 54 on the front rotor portion 50. The projection 62 will be forced into the notches 54 by the spring action of the arm 56. The arm 56 has an upper extension 64 connected to the V-shaped projection 62. The arm extension portion 64 will hit against the outer surface of the teeth 52 when the rotor portion 50 is rotated, and will coact with the V-shaped projection 62 to produce an audible click as the rotor portion 50 is moved in steps measured by each notch. One portion of the periphery of the rotor portion 50 has a notch 66 which is of a size approximately double the peripheral length of one of the notches 54. When the rotor portion 50 is turned by means of the control knob 32, so as to bring the V-shaped projection 62 on the arm 56 into the enlarged notch 66, the lock will be at the starting point for setting the combination thereof.

The rearward portion of the front rotor 26 is smaller in diameter than the portion 50, and, said rear portion is indicated by the numeral 68. The front rotor portion

68 is provided with a pair of spaced apart longitudinally extending conduits 70 and 72 which open at the rear end of the rotor. The front ends of the conduits 70 and 72 are joined by an arc-shaped conduit 74, and this is best seen in Figs. 2 and 3. The conduit formed by the conduit portions 70, 72 and 74, carries an electric conductor 76. The ends of the conductor 76 are connected to the flat contacts 78 which are fixedly mounted in the rear face of the rotor portion 68 in the ends of the conduits 70 and 72. The rotor portion 68 is provided with a fixedly mounted, outwardly extended pin 80.

An intermediate or second rotor 82 is freely rotatably mounted on the rod shaft 30 and is provided with a longitudinally extending pin 84 near the periphery thereof. The pin 84 is adapted to operatively engage the outwardly extended pin 80 on the first rotor portion 68, as more fully described hereinafter. The second rotor 82 is provided with a pair of diametrically disposed, spaced apart, longitudinal conduits 86 and 88. Operatively mounted in each end of the conduits 86 and 88 is a ball bearing contact, as 90. The ball bearing contacts 90 in each of the conduits 86 and 88 are connected electrically by means of a spring, as 92, which spring also functions to bias the ball bearing contacts 90 outwardly into engagement with flat contacts on the adjacent rotors. The outer peripheral surface of the second rotor 82 is provided with a plurality of serrations, as 94. A rod 96 is fixedly mounted between the top and bottom walls, and, is adapted to abut the serrations 94 on the rotor 82. The rod 96 coacts with the serrations 94 to provide a friction-braking means for the rotor 82, so as to hold this rotor in position when it is not being rotated by any means.

A third or rear rotor 98 is freely and pivotally mounted on the shaft 30, and, is provided with a pair of diametrically spaced apart longitudinally extending conduits 100 and 102. A ball bearing contact, as 104, is operatively mounted in the rear end of each of the conduits 100 and 102. The ball bearing contacts are electrically connected to a spring, as 106, which is mounted in each of the conduits 100 and 102. The front ends of the conduits 100 and 102 are each provided with a flat contact, as 108. The flat contacts 108 are adapted to be electrically connected to the ball bearing contacts 90 in the intermediate rotor 82, when the rotors are properly aligned. The third or rear rotor 98 is provided with an outwardly extending pin 110, on the periphery thereof, and this pin is shown in Figs. 1 and 4. The pin 110 is adapted to be operatively engaged by the longitudinal pin 84 in the second rotor 82, in a manner more fully described hereinafter. The peripheral surface of the rotor 98 is provided with a plurality of serrations, as 112, which are adapted to be frictionally engaged by a rod, as 114, which extends between the top and bottom walls of the housing 10. The serrations 112 coact with the rod 114 to provide a friction brake for the rotor 98.

Fixedly mounted on the front side of the back wall 12 is a stationary member 116 which is provided with a flange 118 on the rearward end thereof. The flange 118 is provided with a plurality of apertures therethrough, as 120, which are adapted to receive screws, as 122, for releasably retaining the member 116 in place on the back wall 12. The stationary member 116 is provided with a pair of diametrically spaced apart conduits 124 and 126, in which are carried the electrical conducting wires 128 and 130, respectively. The left or front ends of the conduits 124 and 126 carry fixed flat contacts, as 132, which are connected to the wires 128 and 130, and, which are adapted to make electrical contact with the ball bearing contacts 104 in the rotor 98.

The electric wires 128 and 130 are part of an illustrative circuit which is to be controlled by the instant combination lock switch, and, which is to be closed or opened, as desired, by the instant switch. The enlarged annular portion 50 of the first rotor 26 functions with the notches 54 thereon and the arm 56, to provide a clicking means by which the various rotors may be set to complete the circuit through the electric lines 128 and 130. In the use of the disclosed combination lock switch, the operator would first turn the control knob 32 in a clockwise direction, as viewed from the left side of the structure in Figs. 1 and 2. Assuming that the rotors are set up so that the starting point will be with the indicator 34 in the position shown in Fig. 5, the knob 32 will be rotated at least two complete revolutions before the knob is stopped with the indicator 34 opposite the top vertical indicating point 38. Assuming the combination for the lock is a combination of the numbers 11, 7 and 10, the knob 32 is first turned in a clock wise direction from the starting point a distance of 11 clicks. These clicks will be caused by the V-shaped projection 62 on the arm 56 moving from one notch 54 to the adjacent notch 54. It will be understood that, when the indicator 34 is in the starting position opposite the indicating point 38, the V-shaped projection on the arm 56 will be in the enlarged notch 66.

The first two preliminary rotations of the knob 32 cause the pin 80 on the first rotor to engage the longitudinal pin 84 on the second rotor, which latter pin is then picked up or is moved into abutment with the pin 110 on the third rotor 98. Turning the knob two revolutions cleared the lock and put it in a position for making the aforedescribed first move of 11 clicks to the right from the starting point. After the knob has been turned from the starting point to the right or clockwise, the appropriate number of clicks, as, for example, 11 clicks, the control knob 32 is then turned one complete revolution to the left or counter clockwise which would be to the approximate position of 11 clicks to the right of starting. Rotation of the control knob to the left or counter clockwise is continued past this one complete revolution and on back to the starting point. The aforegoing action then completes the setting of the third rotor 98 and aligns the conduits 100 and 102 with the conduits 124 and 126 in the stationary member 116. The second step of moving the knob to the left or counter clockwise slightly more than one full revolution, sets the lock for moving the intermediate rotor 82. This movement of the middle rotor 82 is effected when the pin 80 on the first rotor 26 has been completely rotated so as to engage the longitudinal pin 84 in the intermediate rotor 82 on the opposite side thereof, to move the middle rotor 82 to the left or counter clockwise, a desired number of clicks. In the example, the second step of setting the middle rotor will be illustrated by moving the control knob from the starting position seven clicks to the left or counter clockwise. This movement aligns the conduits 86 and 88 with the conduits 100 and 102 in the third rotor 98, whereby, the ball bearing contacts 90 will engage the flat contacts 108 in the rotor 98. The final step in completing the circuit is then made by moving the control knob 32 back to the starting position, with the indicator 34 as shown in the position of Fig. 5. The first rotor 26 is then set in position by moving the control knob 32 10 clicks to the right or clockwise. The latter mentioned rotation of the control knob 32 aligns the conduits 70 and 72 in the rotor 26 with the conduits 86 and 88 of the rotor 82.

It will be seen that, when the last mentioned movement of the knob 32 has been made, the circuit will have been completed through the various conductors in the rotors and stationary member between the lines 128 and 130.

It will be understood that, the combination hereinbefore described is merely illustrative, and that the combination can be changed as desired. The combination of the number of clicks for each rotor can be changed in

various ways, as, for example, changing the relative positions of the control knob and its fixed position relation to the first rotor **26**. A further method for changing the combination of the lock would be to change the starting position. Another method for changing the combination of the lock would be to change the position of the stationary member **116** relative to the back wall **12**. It will also be seen that, the indicator member **34** on the control knob **32** may be covered with a luminous paint which would glow in the dark, if desired. However, it will be seen that, the pointer **34** could easily be felt in the dark, and that there would be no need for it to be seen for operation of the lock.

Although the invention is illustrated with a clicking mechanism for setting the rotors relative to each other to complete the circuit, it will be understood that the clicking device could be eliminated and that numbers could be substituted therefor on the outer face of the front wall **18**. It will be seen that, the lock may be made to any desired size, and that it is a very compact and simple device in construction. The rotors **26, 82** and **98** are made from any suitable dielectric or non-conductive material.

While it will be apparent that the preferred embodiment of the invention herein disclosed is well calculated to fulfill the objects above stated, it will be appreciated that the invention is susceptible to modification, variation and change without departing from the proper scope or fair meaning of the subjoined claims.

What I claim is:

1. In a device of the class described, a supporting structure; a stationary member mounted in said supporting structure; a shaft rotatably carried by said supporting structure and passing through said stationary member; a pair of spaced apart electrical conductive wires; a plurality of rotors mounted on said shaft; one of said rotors being fixed on said shaft and the others being freely rotatable thereon; electrical conductive elements in each of said rotors; the electrical conductive elements in said stationary member being connected to said wires; means on said rotors for rotating the rotors for aligning the conductive elements in said rotors with said conductive wires, when said shaft is rotated to electrically connect said wires; and, means for indicating the relative positions of said rotors when the rotors are rotated.

2. In a device of the class described, a supporting structure; a stationary member mounted in said supporting structure; a shaft rotatably carried by said supporting structure and passing through said stationary member; a pair of spaced apart electrical conductive wires; a plurality of rotors mounted on said shaft; one of said rotors being fixed on said shaft and the others being freely rotatable thereon; electrical conductive elements in each of said rotors; the electrical conductive elements in said stationary member being connected to said wires; means on said rotors for rotating the rotors for aligning the conductive elements in said rotors with said conductive wires, when said shaft is rotated to electrically connect said wires; and, a clicking mechanism mounted on said device for indicating the relative positions of said rotors when the rotors are rotated.

3. In a device of the class described, a housing; a stationary member mounted in said housing; a shaft rotatably carried in said housing and passing through said stationary member; said shaft extending outwardly from the front side of the housing; a knob on the shaft for manually rotating the shaft; a pair of spaced apart electrical conductive wires mounted in said stationary member; a first rotor fixedly mounted on said shaft for rotation therewith; a plurality of other rotors mounted on said shaft and being freely rotatable thereon; electrical conductive elements in each of said rotors; means for adjusting said rotors to a predetermined relationship with each other when said shaft is manually rotated by said knob, to electrically connect said wires by aligning the conductive elements therewith; and, a clicking mechanism mounted on said device for indicating the relative positions of said rotors when the rotors are rotated.

4. The invention as set forth in claim 3, wherein: said clicking mechanism comprises a plurality of peripherally disposed projections on said first rotor; and, a resilient arm mounted on said housing and being adapted to engage said projections as the first rotor is turned, whereby a distinct click is produced when the first rotor is turned a distance equal to one projection.

5. A combination lock switch of the class described comprising: a housing; a front wall and a back wall in said housing; a stationary member mounted in said housing; a shaft rotatably mounted in said housing and extending through said stationary member and front and back walls; a knob on the front end of the shaft for manual rotation thereof; a pair of spaced apart electrical conductive wires fixedly mounted in said stationary member; an electrical contact on the inner end of each of said wires; a front rotor fixedly mounted on said shaft adjacent the front wall of the housing; an intermediate rotor mounted on said shaft and being freely rotatable thereon and being adapted to abut said first rotor; a rear rotor mounted on said shaft and being freely rotatable thereon and being adapted to abut said intermediate rotor and the electrical contacts on said wires; electrical conductive elements in each of said rotors; means on said rotors for adjustment thereof to a predetermined relationship, about the shaft and with respect to each other, when said shaft is manually rotated by said knob, whereby the conductive elements in the rotors will be aligned and will interconnect said contacts on said wires; and, means for indicating the relative positions of the rotors when the shaft is turned by the knob.

6. The invention as set forth in claim 5, wherein: said indicating means comprises a clicking mechanism which produces an audible click when the shaft is turned through a predetermined angle of rotation.

7. The invention as set forth in claim 5, wherein: said electrical conductive elements in each of said rotors comprise a pair of spaced apart conductors in each of said intermediate and rear rotors and which extend longitudinally therethrough; and, a pair of spaced apart conductors in said front rotor, which extend inwardly longitudinally and which are electrically interconnected by a third conductor.

8. The invention as set forth in claim 7, wherein: said rotors are made from a dielectric material; and, said knob and housing front wall are provided with means for a reference point from which the adjusting of the rotors is commenced.

9. The invention as set forth in claim 7, wherein: means are provided in said housing for frictionally braking said intermediate and rear rotors to hold said rotors in place when not being moved by said front rotor.

10. A combination lock switch of the class described comprising: a housing; a front wall and a back wall in said housing; a stationary member mounted in said housing; a shaft rotatably mounted in said housing and extending through said stationary member and front and back walls; a knob on the front end of the shaft for manual rotation thereof; a pair of spaced apart electrical conductive wires fixedly mounted in said stationary member; an electrical contact on the inner end of each of said wires; a front rotor fixedly mounted on said shaft adjacent the front wall of the housing; an intermediate rotor mounted on said shaft and being freely rotatable thereon and being adapted to abut said first rotor; a rear rotor mounted on said shaft and being freely rotatable thereon and being adapted to abut said intermediate rotor and the electrical contacts on said wires; electrical conductive elements in each of said rotors comprising, a pair of spaced apart conductors in each of said intermediate and rear rotors and which extend longitudinally therethrough, and, a pair of spaced apart conductors in said front rotor which extend

inwardly longitudinally and which are electrically interconnected by a third conductor; means on said rotors for adjustment thereof comprising, a pin on the front rotor extending radially outwardly therefrom; means on said intermediate rotor extending forwardly therefrom and being adapted to be drivingly engaged by the pin on the front rotor; a pin on the rear rotor extending radially outwardly therefrom; and, means on said intermediate rotor extending rearwardly therefrom and being adapted to drivingly engage the pin on the rear rotor.

11. The invention as defined in claim 10, wherein: said switch includes a clicking mechanism comprising a plurality of notches on the periphery of said first rotor with one of said notches being longer than the others; and, a resilient arm mounted on said housing and being adapted to engage said notches as the first rotor is turned, whereby a distinct click is produced when the first rotor is turned a distance equal to one notch except when the arm engages the longer notch.

12. A combination lock switch of the class described comprising: a housing; a front wall and a back wall in said housing; a stationary member releasably mounted in said housing; a shaft rotatably mounted in said housing and extending through said stationary member and front and back walls, a knob on the front end of the shaft for manual rotation thereof; a pair of spaced apart electrical conductive wires fixedly mounted in said stationary member; an electrical contact on the inner end of each of said wires; a front rotor fixedly mounted on said shaft adjacent the front wall of the housing; an intermediate rotor mounted on said shaft and being freely rotatable thereon and being adapted to abut said first rotor; a rear rotor mounted on said shaft and being freely rotatable thereon

and being adapted to abut said intermediate rotor and the electrical contacts on said wires; electrical conductive elements in each of said rotors; means on said rotors for adjustment thereof to a predetermined relationship with respect to each other, when said shaft is manually rotated by said knob, whereby the conductive elements in the rotors will be aligned and will interconnect said contacts on said wires; means for indicating the relative positions of the rotors when the shaft is turned by the knob; said means on said rotors for adjustment thereof comprising a pin on the front rotor extending radially outwardly therefrom; means on said intermediate rotor extending forwardly therefrom and being adapted to be drivingly engaged by the pin on the front rotor; a pin on the rear rotor extending radially outwardly therefrom; and, means on said intermediate rotor extending rearwardly therefrom and being adapted to drivingly engage the pin on the rear rotor.

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