June 4, 1935. G. T. HOSKING 2,003,650

COMBINATION LOCK WITH ELECTRICAL SWITCH CONTROL

Filed April 18, 1933 2 Sheets-Sheet 1

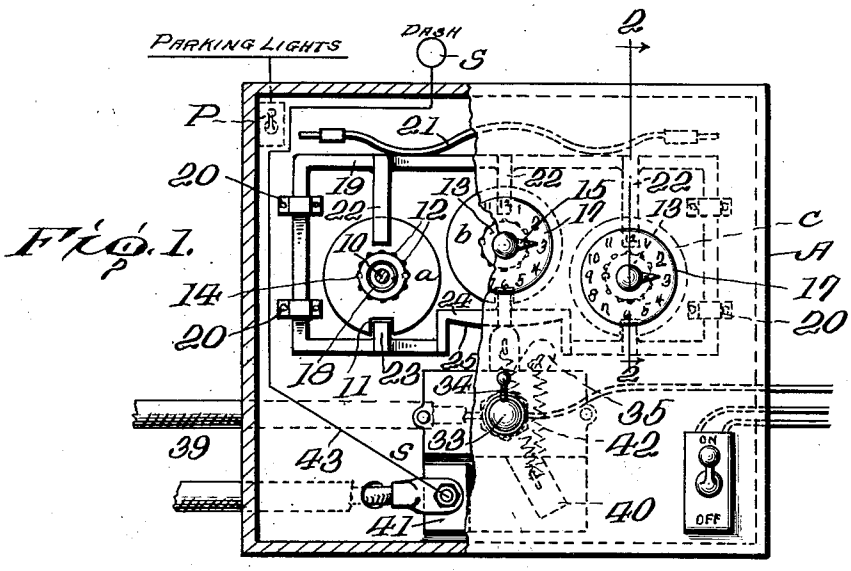


FIG. 1.

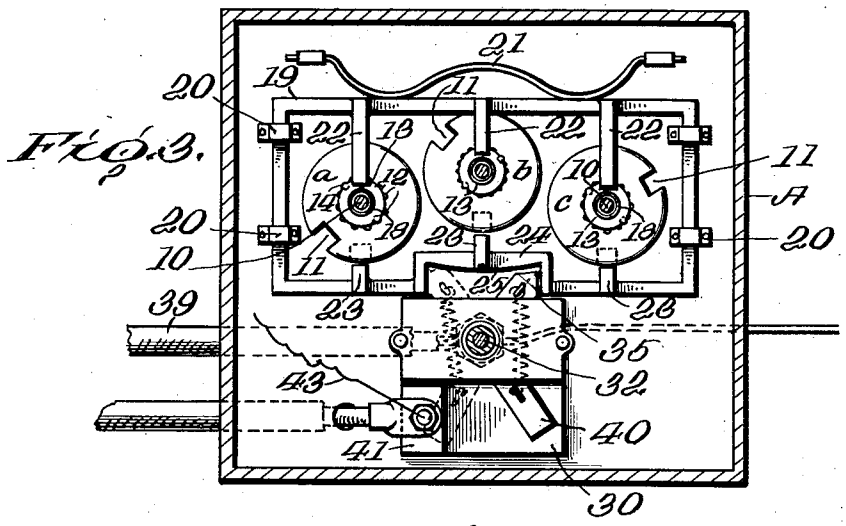


FIG. 3.

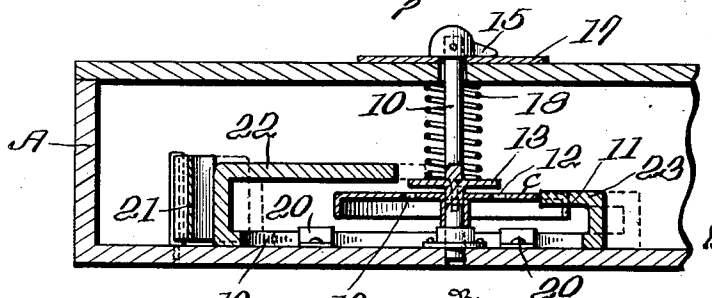


FIG. 2.

Inventor

George T. Hosking

By

Wm. S. Hodges

Attorney

June 4, 1935. G. T. HOSKING 2,003,650

COMBINATION LOCK WITH ELECTRICAL SWITCH CONTROL

Filed April 18, 1933 2 Sheets-Sheet 2

FIG. 4.

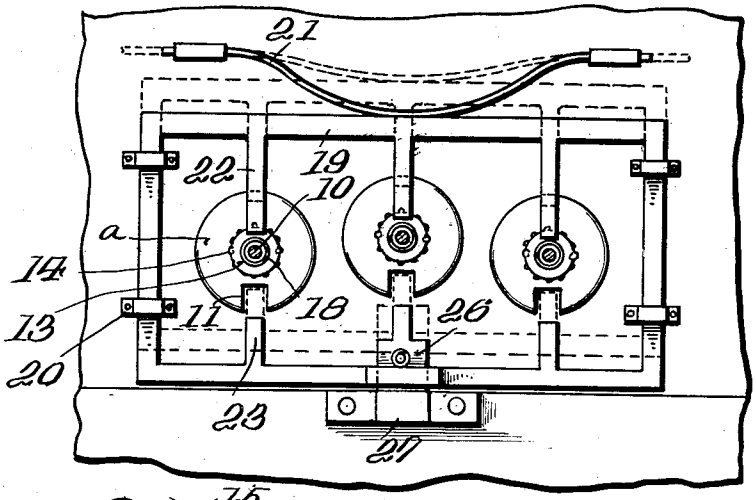


FIG. 5.

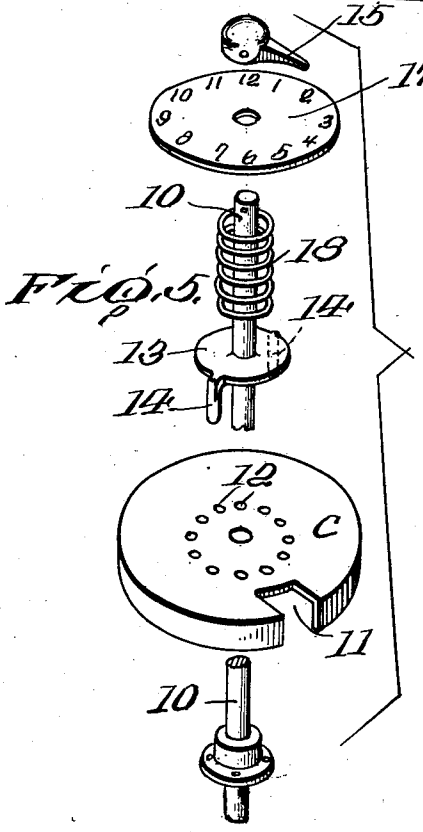


FIG. 6.

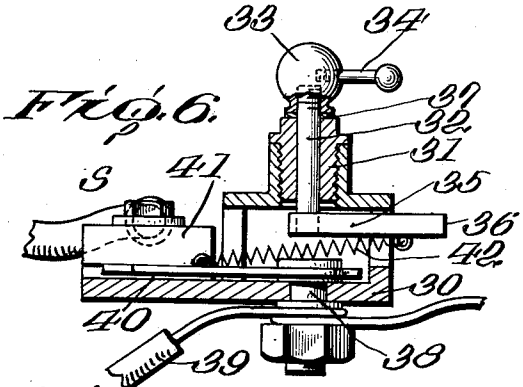
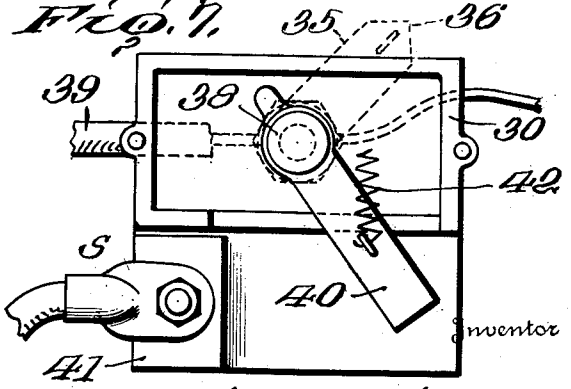


FIG. 7.



Inventor

George T. Hosking

By Wm. B. Hodges

Attorney

Patented June 4, 1935 2,003,650

UNITED STATES PATENT OFFICE

2,003,650

COMBINATION LOCK WITH ELECTRICAL SWITCH CONTROL

George T. Hosking, Somerville, Mass., assignor of one-fourth to Thomas G. Phillips, Somerville, Mass., and one-fourth to Gomer R. Lewis, Waterbury, Conn.

Application April 18, 1933, Serial No. 666,752

5 Claims. (Cl. 70—53)

This invention is a lock of the type in which the locking functions of a latch or other movable member are controlled by rotatable tumbler discs or similar elements, arranged to be adjusted to predetermined relative positions.

One of the objects of the invention is to provide a simply constructed combination lock, including a plurality of associated recessed discs cooperating with a slide-bar having members complemental to the recesses in the discs, and actuating means for the slide-bar, the whole so constructed and arranged that movement of the slide-bar is normally prevented until the recesses have been moved to predetermined relative and cooperative positions. A further object is to provide a lock of the character described, in which the predetermined positions of the discs are controlled by disconnectible shafts, and simple means for quickly and effectively adjusting said shafts with respect to their discs, so as to alter the combinations which regulate the degree of rotation of each disc necessary to bring the recesses in the discs, to the predetermined positions above referred to. A further object is to provide a lock structure of the type above mentioned, provided with means for preventing the changing of the relations of the disconnectible shafts and their discs while the slide-bar is in a predetermined or locked position. A further object is to provide a combination lock of the character mentioned, so constructed and arranged as to control one or more electric circuits, such for instance as the operating circuits of the type commonly installed on standard motor vehicles. A further object is to provide a circuit-control lock, so constructed and arranged that short-circuiting of the standard type ignition switch, so as to accomplish surreptitious and unauthorized operation of the vehicle will be unavailing.

The invention will be hereinafter fully set forth and particularly pointed out in the claims.

In the accompanying drawings:—

Figure 1 is a top plan view illustrating a lock of the character described, the top of the casing being broken away. Figure 2 is a transverse vertical section on the line 2—2 of Fig. 1. Figure 3 is a horizontal section with the operating shafts removed, and showing the lock applied to a standard type motor vehicle operating circuit. Figure 4 is a similar view showing the lock adapted for locking the cover of a box or similar object. Figure 5 is a detail perspective view illustrating one of the operating shafts for the discs. Figure 6 is a vertical sectional view illustrating the details of the operating cam for the lock slide-bar and the connections between the same and the movable element of an electric switch. Figure 7 is a detail plan view illustrating the movable and fixed contacts of the switch.

Referring to the drawings, A designates a casing which may be of any desired construction, but as illustrated in the drawings is shown of rectangular form. Located within said casing are three circular tumbler discs *a*, *b*, *c*, through each of which is loosely passed a vertical shaft **10** which is arranged for axial and rotative movement in suitable bearings in the top and bottom, respectively of the casing A, said shafts serving to retain the tumbler disks in place. Each tumbler disc is provided with a single radially disposed peripheral recess **11**, and is also provided with a circular series of perforations **12** arranged in a circle concentric with its respective shaft **10**. Each of said shafts is provided with a fixed flange **13** having depending, diametrically opposite pins **14** positioned to enter the perforations **12** of its tumbler disc. At the upper end of each shaft **10** is a pointer **15**, each fixedly secured to its shaft and movable over a stationary scale, preferably in the form of a fixed circular disc **17** on the cover of casing A, each of said discs having a series of numbers corresponding to the positions and numbers of perforations **12** in the tumbler discs *a*, *b*, or *c*. Interposed between the flanges **13** and the top of the casing A are springs **18**, which normally react against the flanges to press the shafts **10** downwardly, in an axial direction so as to yieldably hold the pins **14** in engagement with the perforations **12**.

The tumbler discs *a*, *b* and *c*, and their shafts **10** are enclosed within a rectangular slide-bar **19** of skeleton form, the ends of said bar being slidably mounted beneath fixed keepers **20**, a spring **21** serving to normally force said slide-bar to a predetermined forward or unlocked position, as viewed in the drawings. One of the sides of said slide-bar is provided with fingers **22**, which project diametrically toward the opposite side, and are located in a plane to overlie the respective flanges **13** on the shafts **10**, while the slide-bar is in the forward position under the tension of the spring **21**. The opposite side member of the slide-bar is provided with lugs **23**, which project diametrically toward the first mentioned side, and are complemental to the recesses **11** in the respective tumbler discs. It will be noted that the fingers **22** are parallel with each other in the same plane and that the lugs **23** are also parallel with each other in a common plane, but that the group of fingers **22** and the group of fingers **23** are in

different planes. Also, that in Figure 3 that portion of the side member of the slide-bar which carries lugs 23 is offset, as indicated at 24, and provided with a slight recess 25 for a purpose to be later described. This offset arrangement is desirable where the middle disc is set back in order to conserve space but the invention is not limited in this particular. In the form illustrated in Figure 4, a post 26 is secured to said side member for manual movement of the slide-bar against the tension of the spring 21, said post having a lug 27 positioned to fit within a slot or beneath a lug to prevent raising of the cover of the casing A.

In practice, the shafts 10 are moved axially against the tension of their springs 18, and then rotated so as to bring the pins 14 on the flanges 13 into engagement with any pre-selected holes 12. This adjustment moves the pointers 15 to numbers on the scale 16 corresponding to the positions of the holes engaged by said pins. In order to bring the recesses 11 of the tumbler discs to positions to be engaged by the lugs 23, it is obviously necessary to bring the pointers to those pre-selected key numbers of the scales 17. As soon as the discs have been so adjusted as to bring all of the recesses 11 opposite the lugs 23, the slide-bar may be moved backwardly against the tension of the spring 21, said recesses providing clearance for this movement. While the slide bar is held rearwardly against the tension of said spring, it is possible to lift the shafts 10 and to change the rotative positions thereof with respect to the tumbler discs, if so desired, but it will be observed that it will be impossible to make any such adjustment while the slide-bar is moved to its forward position under the tension of spring 21, because the fingers 22 will overlie the flanges 13 and prevent such axial movement of the shafts as will effect disengagement of said flanges and said tumbler discs.

In the structure illustrated in Figure 4, rearward movement of the slide-bar with the post 26, disengages the lug 27 from its complemental member. Just as soon as any or all of the tumbler discs are rotated, while the slide-bar is in its forward position under the tension of spring 21, rearward movement of the slide-bar is prevented by reason of the lugs 23 engaging the peripheries of the tumbler discs, and the parts are therefore held in locked position until the discs have been adjusted to again bring the recesses 11 to the required predetermined positions for engagement by the lugs 23. Of course, it is to be understood that the working parts are normally hidden from view by a cover of opaque material, through which the shafts 10 extend, and on the top of which the scales 16 are placed in such a manner that the pointers 15 may move thereover.

The invention herein described is particularly adapted for use in locking electrical switches against tampering, and particularly for locking a master switch controlling the wiring systems of standard type automobiles. In this connection attention is invited to Figures 6 and 7, in which a master switch S is mounted in a casing 30 of suitable dielectric material, said casing being formed in two parts, which are normally held in abutted relation by suitable bolts in a manner well understood in the switch art. Extending from the top of the switch casing is a sleeve 31, in which is rotatably mounted a cam shaft 32, provided at its upper end with an enlargement or head 33 in which is secured an operating handle 34. To the lower end of the shaft 32 is secured a radially disposed cam arm 35, the outer end of which extends through a slot in the casing, at a position to engage the offset portions 24 of the slide-bar 19. The end of said cam arm is provided with a point 36 so as to engage the recess 25, and a suitable spring washer 37 is provided to maintain a tension on the shaft.

In the lower part of the casing 30 is mounted a stud 38 in axial alignment with the cam shaft 32, the lower side of said stud being connected in suitable manner to one or more cables or conductors 39 leading to the starting motor, ignition, etc. (not shown) which normally control the starting and operation of the motor vehicle engine. Pivotally mounted on the stud 38 is a movable switch arm 40, complemental to a fixed contact 41, which leads from a suitable source of electrical energy, such as a storage battery (not shown). The fixed contact 41 is so positioned that it lies in the path of movement of the switch arm 40, said switch arm and said cam arm 35 being connected by a coil spring 42. In operation with the parts in locked position, the outer end of the cam arm 35 rests against the face of the offset 24, so that it cannot be moved until the slide-bar is released. In moving the cam member manually to this position by means of handle 34, the pull upon spring 42 will move the switch arm 40 out of engagement with its fixed contact. While the parts are in such positions, therefore, it is impossible to move the cam arm to a position to bring the switch contacts into engagement, because the locking lugs 23 are engaged with the peripheries of the tumbler discs. The arrangement of the spring 42 is such that as the cam arm is moved by manual rotation of the shaft 32, said spring moves to one side or the other of the dead center and exerts a pull on the movable contact 40 which results in a snap action. In order to close the switch it is first necessary to manipulate the tumbler discs *a*, *b* and *c*, to bring the recesses 11 in positions to receive the lugs 23, and thereby permit rearward movement of the slide-bar against the tension of its spring. This rearward movement is accomplished by manually rotating the cam shaft 32 in a direction to bring the end of the cam against the offset portion 24, the effect of which engagement is to impart a forced rearward movement to the slide-bar, and as the free end of the cam arm moves the spring 42 across the dead center, the switch arm 40 is snapped into engagement with its fixed contact. While the switch is in circuit closed position the tumbler discs are not disturbed, and therefore the lugs 23 and recesses 11 are always so positioned that free movement of the cam shaft is permitted. To break the circuit and lock the switch, it is only necessary to rotate the cam shaft so as to move the switch arm 39 out of engagement with the fixed contact. Just as soon as the cam arm reaches a position which will accomplish this adjustment, the spring 21 will move the slide-bar forwardly, after which the discs may be rotated by means of the shafts 10, thereby moving the recesses to positions which will bring the peripheries of the discs into engagement with the lugs on the slide-bar. In this manner the parts are positively locked until the tumbler discs are again rotated to the predetermined positions for which they are set.

By placing the standard type ignition switch 1 of the motor vehicle between the fixed contact 41 and the circuits (not shown) normally controlled by said ignition switch, it is obvious that a mere

short circuiting of the ignition switch, which is a common method of surreptitiously starting a motor vehicle, will be unavailing, because the line will be dead between the ignition switch and the fixed contact 41. For purposes of parking lights and dash lights, a line 43 may be taken from the fixed contact 41 to a parking light switch P and a dash light switch S, which will be available at all times. With the construction shown, it would be obviously impossible to short circuit the system while the main switch S is in open circuit position, because any one attempting to do this would be obliged to make a complete wiring back to the battery; otherwise the generator output would "blow" every light. The details of the electric system of a motor vehicle are not shown or described, because they are so fully and well understood in the art that no difficulty should be experienced by one skilled in the art in connecting the master switch above described, to such a system.

The advantages of the invention will be readily understood by those skilled in the art to which it belongs. For instance, it will be apparent that a very simple and effective form of locking means is provided, which will normally prevent unlocking movement of the slide-bar by any person not familiar with the figures or "combination" to which the different tumbler discs are set, in order to bring their recesses in parallel predetermined position. A further and important advantage is that it is impossible in the structure shown, to change the combination while the parts are in locked position, because the slide-bar is provided with means for engaging the flanges on the disc shafts, in a manner to prevent any such movement until the slide-bar has been moved to unlocking position. Thus, it will be seen that the slide-bar not only locks the device which is intended to be held against operation, but also locks the device against any unauthorized change in adjustment. A further advantage is that a very simple and inexpensive master-switch-control is provided for electric circuits, and which possesses peculiar and especial advantage in connection with the operating circuits of a standard motor vehicle.

Having thus explained the nature of the invention and described an operative manner of constructing and using the same, although without attempting to set forth all of the forms in which it may be made, or all of the forms of its use, what is claimed is:—

1. A lock of the character described comprising a plurality of relatively spaced tumbler disks each having a peripheral opening therein, a plurality of axially and rotatably adjustable shafts, one for each tumbler disk, each shaft being extended loosely through its tumbler disk in such manner as to retain the disk in position, a control disk fixed to each shaft at a position to overhang the tumbler disk of said shaft, the control disk and the adjacent tumbler disk of each shaft having complemental interlocking means so constructed and arranged that the disks may be engaged and disengaged by axial movements imparted to the shaft, a slide bar having lugs complemental to the peripheral recesses of said tumbler disks, a spring yieldably holding said slide bar in such position that said lugs and said disks are normally disengaged, and means constructed and arranged to impart slidable movement to said slide bar against the tension of said spring, said slide bar also having means constructed and arranged to overlie said control disks in such manner as to prevent axial movement of the shafts while said lugs are disengaged from said recesses.

2. A lock of the character described comprising a slide bar having relatively spaced side members, a plurality of relatively spaced tumbler disks located between said side members and each having a peripheral opening therein, a plurality of axially and rotatably adjustable shafts also located between the side members of the slide bar, there being one shaft for each tumbler disk, each shaft being extended loosely through its tumbler disk in such manner as to retain the disks in position, a control disk fixed to each shaft at a position to overhang the tumbler disk of said shaft, the control disk and the adjacent tumbler disk of each shaft having complemental interlocking means so constructed and arranged that the disks may be engaged and disengaged by axial movements imparted to the shaft, lugs projecting from one of said side members in such manner as to engage the respective peripheral recesses of the tumbler disks, fingers projecting from the opposite side member in such manner as to overlie the control disks and prevent axial movement of the shafts while said lugs are disengaged from said disks, a spring normally acting to maintain the slide bar in such position as to disengage the lugs from said tumbler disks, and means for moving the slide bar against the tension of said spring.

3. A lock of the character described comprising a rectangular slide bar of skeleton form having oppositely disposed side members connected by end members, means for slidably anchoring the end members of said slide bar, a plurality of relatively spaced tumbler disks enclosed by said slide bar, each of said disks having a peripheral opening therein, a plurality of axially and rotatably adjustable shafts located within the space surrounded by said slide bar, there being one shaft for each tumbler disk, each shaft being extended loosely through its tumbler disk in such manner as to retain the disk in position, a control disk fixed to each shaft at a position to overhang the tumbler disk of said shaft, the control disk and the adjacent tumbler disk of each shaft having complemental interlocking means so constructed and arranged that the disks may be engaged and disengaged by axial movements imparted to the shaft, lugs projecting from one of said side members in such manner as to engage the respective peripheral recesses of the tumbler disks, fingers projecting from the opposite side member in such manner as to overlie the control disks and prevent axial movement of the shafts while said lugs are disengaged from said disks, a spring normally acting to maintain the slide bar in such position as to disengage the lugs from said tumbler disks, and means for moving the slide bar against the tension of said spring.

4. A lock of the character described comprising a slide bar of skeleton formation having oppositely disposed side members, one of said side members being inwardly offset, a plurality of relatively spaced tumbler disks located in the space between said side members, and each having a peripheral opening therein, a plurality of axially and rotatably adjustable shafts also located in the space between said side members, there being one shaft for each tumbler disk, each shaft being extended loosely through its tumbler disk in such manner as to retain the disk in po-

sition, a control disk fixed to each shaft at a position adjacent to the tumbler disks of said shaft, one of said disks having an interlocking member of sufficient length to span the space between the disks, the other disk having complemental portions engageable with said interlocking member in such manner that the disks on each shaft are directly engageable and disengageable by axial movements imparted to the shaft, lugs projecting from one of said side members in such manner as to engage the respective peripheral recesses of the tumbler disks, fingers projecting from the opposite side member in such manner as to overlie the control disks and prevent axial movement of the shafts while said lugs are disengaged from said disks, a spring normally acting to maintain the slide bar in such position as to disengage the lugs from said tumbler disks, and a rotatively mounted arm having an end portion engageable with the offset portion of the slide bar in such manner that rotative movements of the arm will impart slidable movement to said slide bar.

5. A lock of the character described comprising a plurality of relatively spaced tumbler disks each having a peripheral opening therein, a plurality of axially and rotatably adjustable shafts, one for each tumbler disk, each shaft being extended loosely through the tumbler disk in such manner as to retain the disks in position, a control disk fixed to each shaft at a position adjacent to the tumbler disks of said shaft, one of said disks having an interlocking member of sufficient length to span the space between the disks, the other disks having complemental portions engageable with said interlocking member in such manner that the disks on each shaft are directly engageable and disengageable by axial movements imparted to the shaft, a slide bar having lugs complemental to the peripheral recesses of said tumbler disks, a spring yieldably holding said slide bar in such position that said lugs and said disks are normally disengaged, and means constructed and arranged to impart slidable movement to said slide bar against the tension of said spring, said slide bar also having means constructed and arranged to overlie said control disks in such manner as to prevent axial movement of the shafts while said lugs are disengaged from said recesses.

GEORGE T. HOSKING.