May 17, 1966 F. W. SIEGEL 3,251,204

COMBINATION LOCK FOR AUTOMOTIVE VEHICLE IGNITION AND HOOD

Filed Nov. 2, 1964 2 Sheets-Sheet 1

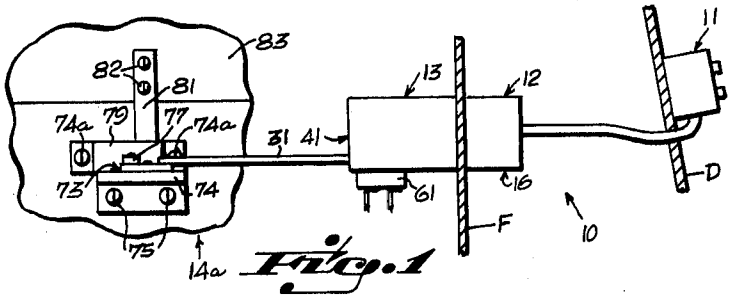


Fig. 1

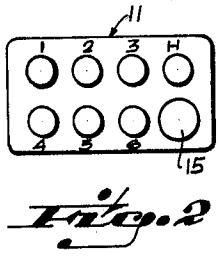


Fig. 2

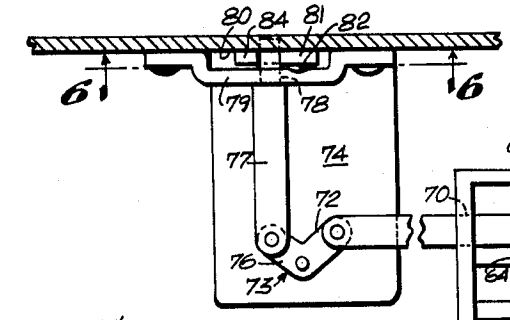


Fig. 3

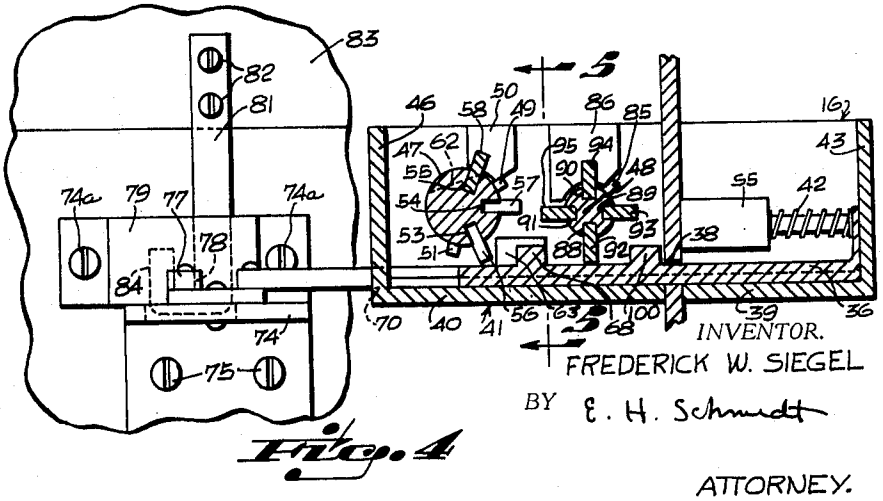


Fig. 4

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COMBINATION LOCK FOR AUTOMOTIVE VEHICLE IGNITION AND HOOD

Filed Nov. 2, 1964 2 Sheets-Sheet 2

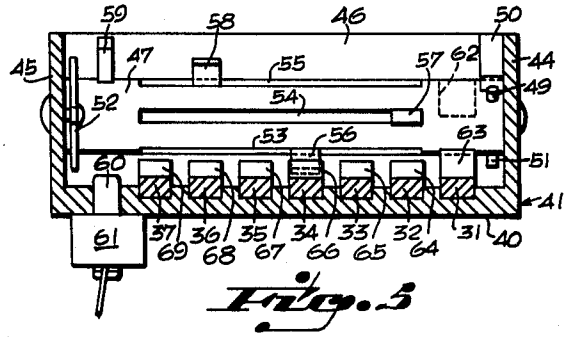


Fig. 5

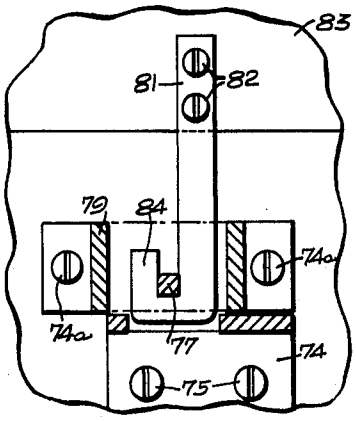


Fig. 6

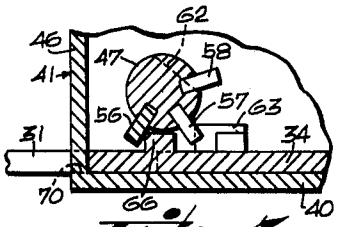


Fig. 7

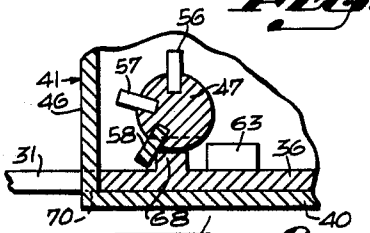


Fig. 9

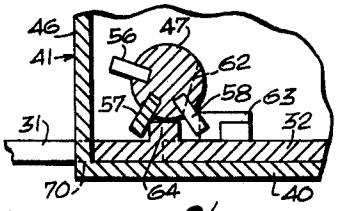


Fig. 8

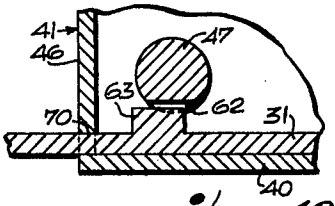


Fig. 10

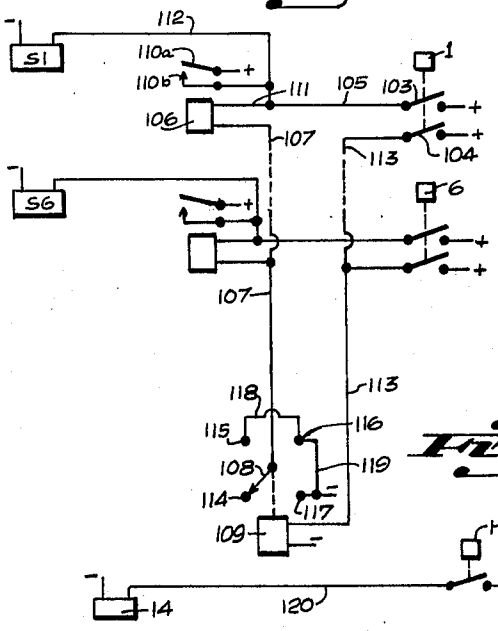


Fig. 12

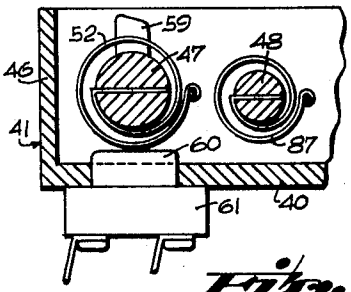


Fig. 11

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3,251,204

COMBINATION LOCK FOR AUTOMOTIVE VEHICLE IGNITION AND HOOD

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Filed Nov. 2, 1964, Ser. No. 408,143
7 Claims. (Cl. 70—241)

My invention relates to security devices for automotive vehicles and is directed particularly to a combination switch and mechanical lock permitting opening of the vehicle hood or bonnet only when the lock is properly actuated to close the ignition switch.

The principal object of my invention is to provide a security device of the character above described comprising an ignition switch and a mechanical hood lock, a rotatable control shaft having a plurality of longitudinal, peripherally-spaced slots, an abutment lug longitudinally adjustably positioned in each of said slots, and a plurality of slide members exceeding in number of the number of said lugs, selected ones of said slide members, when actuated in proper sequential order, being operative to successively incrementally rotate said shaft to a position operative to close the ignition switch and permit actuation of an additional slide member comprising the mechanical hood lock.

Another object is to provide a vehicle security device of the character described including a second shaft in spaced parallel relation to the control shaft and having a plurality of longitudinal lugs actuatable to incrementally rotate said second shaft upon the movement of any one of said slide members, and stop means for limiting the rotation of said second shaft upon actuation of the first slide member in excess of the number required to close the ignition switch, thereby nullifying any attempt to operate the device by continuous random actuation of the slide members.

Still another object is to provide a security device of the above nature which, under emergency conditions, can operate from an outside source of electricity, or be actuated manually.

Yet another object of my invention is to provide a combination lock and switch of the above nature wherein the slide members are in excess of the number needed for operating the device, and wherein the abutment lugs can readily be rearranged in their control shaft slots for changing the combination both with respect to the particular ones of the slide members to be actuated for operation of the device, and their sequence of operation.

Still another object is to provide a security lock for vehicles of the above nature which will be simple in structure, compact and easy to install, and dependable and durable in performance.

Other objects, features and advantages of the invention will be apparent from the following description when read with reference to the accompanying drawings. In the drawings, wherein like reference numerals denote corresponding parts throughout the several views:

FIG. 1 is a schematic drawing illustrating the various components comprising the combination lock embodying the invention and their installed positions in an automobile;

FIG. 2 is a front view of the push button control box, shown separately;

FIG. 3 is a top view of the slide-actuated switch control mechanism and the associated hood lock mechanism;

FIG. 4 is a vertical cross-sectional view taken along the line 4—4 of FIG. 3 in the direction of the arrows;

FIG. 5 is a transverse cross-sectional view taken along the line 5—5 of FIG. 4 in the direction of the arrows;

FIG. 6 is a cross-sectional view taken along the line 6—6 of FIG. 3 and illustrating mechanical details of the vehicle hood lock;

FIGS. 7, 8 and 9 are cross-sectional views taken through the control shaft illustrating successive rotative increments thereof upon being actuated by the correct slide members in correct sequence for unlocking;

FIG. 10 is a view similar to FIG. 9 showing the control shaft in unlocked position and how the transverse groove in the control shaft, when in unlocked position, permits passage of the hood slide member for unlocking the hood lock mechanism;

FIG. 11 is a cross-sectional view taken along the line 11—11 of FIG. 3 in the direction of the arrows and illustrating the shaft return springs and control shaft lug for actuating the ignition switch; and

FIG. 12 is a schematic diagram of the control circuitry for the slide member actuating solenoids.

Referring now in detail to the drawings and referring first to FIGS. 1 and 2, **10** designates, generally, a combination vehicle ignition and hood lock embodying the invention, the same comprising, generally, a push button control box **11** mounted in any convenient manner in the front of the vehicle dashboard D (partially illustrated), a slide actuation unit **12** preferably mounted beneath the dashboard against the outside of the vehicle fire wall F, a control shaft and slide member unit **13** mounted against the inside of the fire wall F directly behind the slide actuator unit **12**, and a hood lock mechanism **14***a* controlled by a hood slide member comprising part of the control shaft and slide member unit **13**.

The control box **11** comprises six electrical switch push buttons designated **1** through **6** connected to energize solenoids S1 through S6, respectively, in the slide actuation unit **12** by electrical circuitry hereinafter described. The control box **11** also has a push button designated by the letter H for energizing a seventh solenoid **14** in the control box **11**, and a pilot light **15** energized whenever the device is unlocked or whenever one or more of the solenoids S1 through S6 remains energized after depression of one or more the manual control switch push buttons **1** through **6**.

The hood solenoid **14** and the shaft control solenoids S1 through S6 comprising the slide actuation unit **12** are mounted in a horizontal row in a housing member **16** secured against the outside of the fire wall F, and comprise backwardly-extending plungers **17** through **23**, respectively, secured at their outer ends to upstanding portions **24** through **30** of elongated slide members **31** through **37**. The slide members **31** through **37** extend forwardly under their respective solenoids and through a slot **38** in fire wall F, and are slidingly disposed against the inside bottom wall **39** of the housing member **16** and the inside bottom wall **40** of a housing member **41** comprising the control shaft and slide member unit **13**. Compression springs **42** ctircumjacent each of the plungers **17** through **23** yieldably hold the plungers in their rearwardmost positions, whereat the upstanding portions **24** through **30** abut the rear wall **43** of the housing member **16** and whereat the slide members **31** through **37** are in fully withdrawn or rest position.

The housing member **41** of the control shaft and slide member unit **13**, which is secured against the inside of the fire wall F in any convenient fashion (not illustrated), further comprises parallel side walls **44** and **45**, and a rear wall **46**. Rotatably journalled within the housing member **41** between the side walls **44** and **45** thereof and in perpendicularly extending relation above the slide members **31** through **37** are a cylindrical control shaft **47** and an auxiliary shaft **48**. The control shaft **47** is provided at one end with a first radial projection **49** which abuts one side of a stop member **50** fixed against the inside of the side wall **44** of the housing member **41**, to limit anti-clockwise motion (as seen in FIG. 5) of said control shaft, and a second radial projection **51**

which abuts the other side of said stop member to limit clockwise motion. A helical torsion spring 52 surrounding the other end of the control shaft 47 and secured at one end thereto and at the other end to side wall 45, serves to yieldingly urge said control shaft in its anti-clockwise-most poistion whereat the first radial projection 49 abuts the stop member 50 (see FIGS. 4 and 5).

The control shaft 47 is formed with three arcuately spaced longitudinal slots 53, 54 and 55 for supporting in an adjusted position therealong, rectangular lugs 56, 57 and 58, respectively. The lugs 56, 57 and 58 may be held by frictional contact in their respective slots, or be secured by circular clips or any other device (not illustrated) for holding them in adjusted position.

As illustrated in FIGS. 3 and 11, the control shaft 47 is also provided near the end wall 45 with a radially-extending lug 59 which, when the control shaft is rotated to its most clockwise position by actuation of the correct three slide members of the slide members 32 through 37 in correct sequence, as is hereinbelow described, moves into abutting engagement with the actuating button 60 of an ignition switch 61 secured to the bottom wall 40 of the housing member 41. The control shaft 47 has a transverse slot 62 in register with the slide member 31 and so positioned about the shaft periphery as to be disposed in its lowermost position (as illustrated in FIG. 10) when said control shaft is rotated to its most clockwise position (as seen in FIGS. 4 and 10). In this position, the ignition switch 61 will be closed as described above, the slide member 31, which has an upstanding rectangular abutment member 63 normally preventing outward sliding motion upon actuation of its associated solenoid 14, can pass under the control shaft 47 as seen in FIG. 10 to unlock the hood lock mechanism 14*a* as is hereinbelow more fully described.

The elongated slide members 31 through 37 are provided with respective upstanding abutment portions 64 through 69, respectively, positioned just rearwardly of the control shaft 47 when said slide members are at rest position.

Operation of the slide mechanism in controlling the incremental rotation of the control shaft 47 will now be described. With the lugs 56, 57 and 58 positioned in their respective slots 53, 54 and 55 as illustrated in FIGS. 3 and 5, it will be noted that lug 56 is in the lowermost position and therefore the first lug in position to be contacted, in this instance by the abutment portion 66 of the slide member 34. FIG. 7 illustrates how the forward movement of the slide member 34 upon energization of its associated solenoid S3 by actuation of switch button 3, will have turned the control shaft 47 by the first incremental amount to bring the lug 57 into position for contact by the abutment portion 64 of the slide member 32. The operator, knowing the combination, will next depress switch button 1 to energize solenoid S1 and thereby actuate slide member 32 to turn the control shaft 47 by the second incremental amount to bring the lug 58 into position for contact by the abutment portion 68 of the slide member 36 (see FIG. 8). The operator will next depress switch button 5 to actuate slide member 36 to turn the control shaft 47 by the third and final incremental amount whereat, as illustrated in FIGS. 9 and 10 and as described above, the ignition switch 61 will be actuated to permit starting the vehicle motor, and whereat the slide member 31 associated with the hood lock mechanism can pass outwardly to unlock the hood. As is hereinbelow described in connection with the description of solenoid control circuit operation, the first three solenoids energized of the solenoids S1 through S6 will remain energized, but will become deenergized upon the next subsequent depression of any one of the control switch buttons 1 through 6. Thus the depression of any button after unlocking of the ignition switch returns the mechanism to rest condition again to turn off or lock the ignition switch. At any time that the ignition switch 61 is "on" or closed, however, depression of the H button on the push button control box 11 will unlock the vehicel hood to permit its being opened by mechanism now to be described with reference to FIGS. 1, 3, 4 and 6.

The slide member 31 associated with the solenoid 14, whose energization is controlled by depression of the "H" push button in the control box 11, is longer than the slide members 32 through 37, and extend through a slot 70 in the rear wall 46 of the housing member 41. The outer end of the slide member 31 is pivotally connected to one arm 72 of a bell-crank member 73 swingably journalled upon a horizontally extending bracket 74 secured against the inside of the vehicle body at one side and just below the rim of the hood opening as by bolts 75. The other arm 76 of the bell-crank member 73 is pivotally connected to one end of a slide bar 77. The other end of the slide bar 77 passes through a slot 78 in a U-shaped bracket 79 also secured to the inside of the vehicle body just above the bracket 74 as by bolts 74*a*. The U-shaped bracket 79 defines a vertically-extending slot 80 through which the lower end of a hook bar 81 secured as by bolts 82 to the hood 83 (partially shown) extends. The lower end of the bar 81 is formed into an upwardly-extending hook 84 defining an opening in register with the outer end of the slide bar 77 and of such size as to receive said slide bar when the hood is closed and in locked condition, as is illustrated in FIGS. 3 and 6. In operation, upon actuation of the slide member 31 its movement to the left (as illustrated in FIGS. 1, 3 and 4) will rotate the bell-crank member 73 anti-clockwisely to withdraw the slide bar 77 out of engagement with the hook bar 81, thereby permitting the hood to be opened in the usual way.

Mechanical means is also provided to prevent sliding movement of any one of the slide members 32 through 37 upon the depression of the fourth switch button of the switch buttons 1 through 6 or upon manual actuation of a fourth slide member of the slide members 32 through 37 in an attempt to unlock the device by random actuation of said buttons or slide members. To this end, the auxiliary shaft 48 is provided with a radial projection 85 which abuts one side of a stop member 86 secured against the inside of the side wall 44 of the housing 41 to limit anti-clockwise rotary motion (as seen in FIG. 5) of said auxiliary shaft, and which abuts the other side of said stop member to limit clockwise rotary motion. A spiral torsion spring 87 surrounding the other end of the auxiliary shaft 48 and secured at one end thereto and at the other end to side wall 45 serves to yieldingly urge said auxiliary shaft in its most anti-clockwise position, whereat the radial projection 85 abuts the right hand side of the stop member 86 (see FIG. 4). The auxiliary shaft 48 is provided with four arcuately spaced end to end longitudinal slots 88, 89, 90 and 91 having secured therein outwardly-projecting longitudinal abutment strips 92, 93, 94 and 95, respectively. The abutment strips 92, 93, 94 and 95 extend transversely above the slide members 32 through 37 and are adapted to be successively actuated by upwardly-extending rear abutment portions 96 through 101 formed on said slide members. It will be understood that each time a different one of the push buttons 1 through 6 is depressed, its corresponding solenoid-actuated slide member will contact and advance the lowermost of the abutment strips 92, 93 and 94 to correspondingly rotatively advance the auxiliary shaft 48 by a discrete incremental amount such that when the third push button is depressed the radial projection 85 will have been advanced into abutment with the outside of the stop member 86 to prevent further clockwise motion of said shaft, and thereby prevent any attempt to unlock the device by random manual actuation of the slide members 32 through 37.

Electrical means is provided to prevent the sequential actuation of a fourth slide member of the slide mem-

bers 32 through 37 upon the depression of the fourth switch button of the switch buttons 1 through 6, and return the apparatus to rest condition again, thereby, in addition to the mechanical means for this purpose, described above, further insuring against possible unauthorized unlocking by random actuation of said buttons. To this end, referring now to the circuit diagram of FIG. 12, the push button 1 comprises a pair of ganged normally open-circuit switch arms 103, 104, switch arm 103 of which is connected to one energization coil terminal of a relay 106 the other energization terminal of which is connected by conductor 107 to the movable contact arm 108 associated with a sequence relay 109.

The relay 106 has a movable contact arm 110*a* normally out of contact with a fixed switch contact arm 110*b* and adapted to contact said fixed contact arm when said relay is energized. The fixed contact arm 110*b* is connected to conductor 105 through conductors 111 and 112, and the solenoid S1 has one energization coil terminal connected through 112 to conductor 105.

The switch arm 104 of the push button 1 is connected through conductor 113 to one energization coil terminal of the sequence relay 109, the remaining energization coil terminal thereof being returned to the negative terminal of the vehicle battery. The movable contact arm 108 of the sequence relay 109 is operative to sequentially contact the fixed contact arms 114, 115, 116 and 117 as the relay is consecutively pulsed or energized, the preceding switch simultaneously being opened so that only one of the switches 108, 114; 108, 115; 108, 116 or 108, 117 will be closed at one time. At the completion of the energization cycle for the four switches, switch 108, 114 will be closed, as illustrated in FIG. 12, and the relay will be in starting or rest position and ready for a new sequence of operation. Since the construction and operation of such sequence relays is well known in the art, it is not further described herein. The fixed contacts 115, 116 and 117 of the sequence relay 109 are connected together and to the negative terminal of the vehicle battery by conductors 118 and 119.

In operation, actuation of the push button 1 will momentarily close circuit the switch arms 103 and 104 to the positive terminal of the vehicle battery. Closure of the switch arm 104 energizes the sequence relay 109 through conductor 113 so that its movable arm 108, which is in open circuit position at rest, will move into contact 115 to complete an energization circuit from the negative battery terminal through conductors 119, 118 and 107 to the relay 106, the remaining energization coil terminal of relay 106 being returned to the positive terminal of the vehicle battery source of supply through conductor 105 and now temporarily closed push button switch arm 103. Energization of the relay 106 closes its normally open switch 110*a*, 110*b* to complete a holding circuit from battery positive through said switch and conductors 111 and 112 to said relay for maintaining said relay energized after the switch button 1 is released and the associated switch arms 103, 104 again move to open circuit positions. Continued energization of the relay 106 will maintain its switch 110*a*, 110*b* closed so as to provide a continued completed energization circuit to one energization terminal of the solenoid S1, the remaining terminal thereof being returned to negative battery. Thus the solenoid S1 will actuate its associated slide member 32 as described above. Since the switch button and solenoids associated with the remaining five slide members are connected in parallel in the above-described circuit, as illustrated by the circuitry associated with relay S6 and push button 6 as illustrated, it will be understood that when the next push button of any one of the buttons 2 through 6 is actuated, its associated slide member will be actuated through energization of its associated solenoid, and that at the same time

the sequence relay 109 will be temporarily energized to advance its movable contact arm in the position of contact 116. When the third of the remaining push buttons is depressed, its associated slide member will be actuated and the sequence relay will again be temporarily energized to advance its movable contact arm to the position of contact 117. At this point, if the proper number and sequence of operation of the push buttons has been observed in the actuation of the push buttons, the device will be unlocked and the ignition switch 61 will be closed, as described above in connection with the mechanical operation of the device. Depressing a fourth button will energize the sequence relay 109 for the fourth time, thereupon returning its rotary switch arm 108 to open or start position again at terminal 114, and deenergizing the three relays previously energized and locked in by their associated switch contact arms. The previously energized solenoids will thus become deenergized and be returned to rest positions, leaving the device in locked condition.

As is further illustrated in FIG. 12, the switch associated with the hood push button H is connected by conductor 120 to one energization coil terminal of the solenoid 14, the other terminal being returned to battery negative. Thus, when the button H is pushed, an energization circuit will be completed to the solenoid 14 from battery positive through conductor 120, to actuate the slide member 31. As described above, if the device is in unlocked condition by proper actuation of the push buttons 1 through 6 the slide member will be unblocked and operative to unlock the hood mechanism as described above.

While I have illustrated and described herein only one form in which my invention can conveniently be embodied in practice, it is to be understood that this form is given by way of example only, and not in a limiting sense. My invention, in brief, comprises all the embodiments and modifications coming within the scope and spirit of the following claims.

What I claim as new and desire to obtain by Letters Patent is:

1. A combination lock for automotive vehicle ignition and hood comprising, an ignition switch, a mechanism for locking a vehicle hood in closed position with respect to the vehicle body, a control shaft having a plurality of longitudinally, peripherally-spaced slots, and rotatable between first and second angular positions an abutment lug longitudinally adjustably positioned in each of said slots, a plurality of control slide members exceeding in number the number of said lugs and slidable between inner and outer positions transversely beneath said control shaft, selected ones of said slide members equal in number to the number of said lugs being operative when moved from their inner to their outer positions to contact respective ones of said lugs to selectively incrementally rotate said shaft from said first to said second position, and means on said control shaft for actuating said ignition switch when moved to said second position.

2. A combination lock for automotive vehicle ignition and hood as defined in claim 1 including a hood slide member slidable between inner and outer positions transversely beneath said control shaft, means blocking the sliding of said hood member from its inner to its outer position when said control shaft is in any rotative position other than said second angular position, and means controlled by the movement of said hood slide member from its inner to its outer position for unlocking said vehicle hood locking mechanism.

3. A combination lock for automotive vehicle ignition and hood as defined in claim 2 wherein a transverse groove is provided in the peripheral wall of said shaft, and an abutment member on said hood slide member operative to pass through said groove when said control shaft is in said second position.

4. A combination lock for automotive vehicle ignition and hood as defined in claim 1 including means preventing the successive actuation of any control slide member in addition to a number of slide members equal to said number of selected ones.

5. A combination lock for automotive vehicle ignition and hood as defined in claim 4 wherein said actuation preventing means comprises an auxiliary shaft in spaced parallel relation with respect to said control shaft and rotatable between first and second positions, means normally yieldingly holding said auxiliary shaft in said first of said positions, a plurality of longitudinally-extending abutment strips fixed in spaced relation about the periphery of said auxiliary shaft, means on said control shaft members contacting said strips when moved from their inner to outer positions for incrementally rotating said auxiliary shaft from said first to said second positions.

6. A combination lock for automotive vehicle ignition and hood as defined in claim 2 including a plurality of solenoids, one for each of said control slide members for actuating said control slide members, an energization

circuit for said solenoids including a plurality of electric push buttons, one for each of said solenoids, and means including a sequence relay in said energization circuit operative to deenergize energized solenoids exceeding in number said number of selected ones of said control slide members upon the successive actuation of said push buttons.

7. A combination lock for automotive vehicle ignition and hood as defined in claim 2 wherein said hood unlocking means comprises a hook member secured to the hood of a vehicle, and a slide bar secured to the vehicle body and movable between positions in and out of engagement with said hook member.

References Cited by the Examiner

UNITED STATES PATENTS

2,491,561	12/1949	Horne et al.	70—241 X
2,494,015	1/1950	Tate et al.	200—43
2,718,776	9/1955	Moore	70—241

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