April 12, 1938. R. A. SANDBERG ET AL 2,113,563

AUTOMOBILE LOCK

Filed Jan. 2, 1937

Fig. 1.

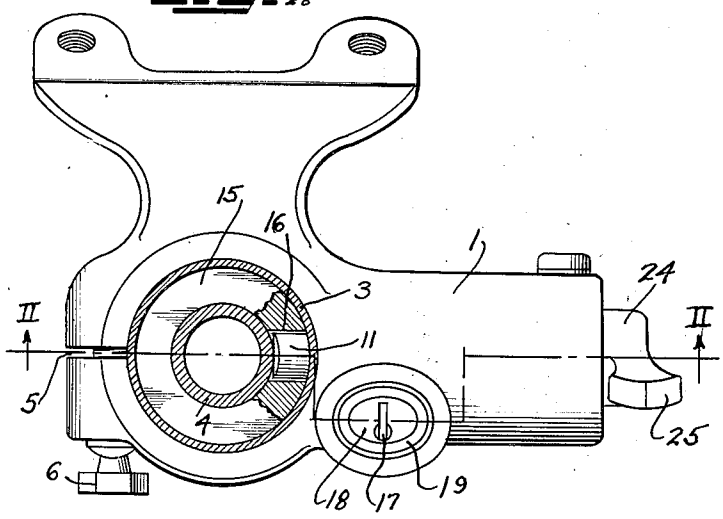


Fig. 2.

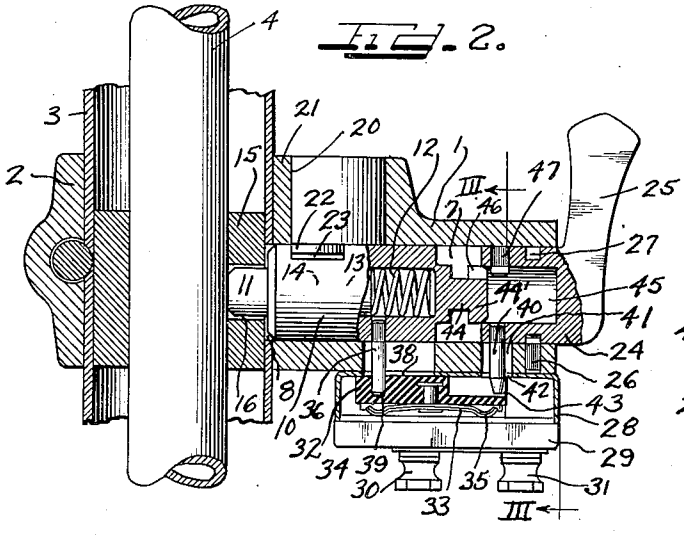


Fig. 3.

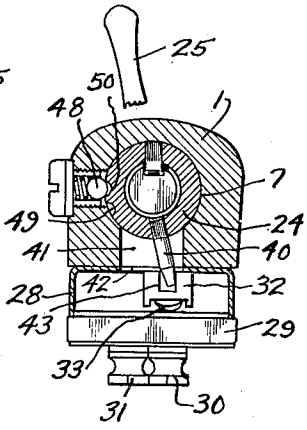


Fig. 4.

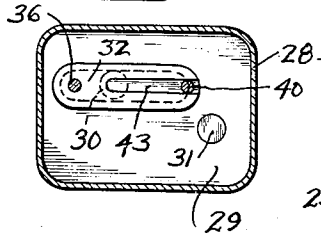
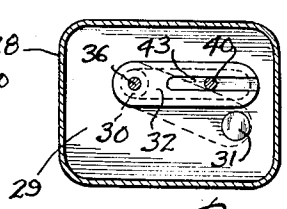


Fig. 5.



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UNITED STATES PATENT OFFICE

2,113,563

AUTOMOBILE LOCK

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Application January 2, 1937, Serial No. 118,791

6 Claims. (Cl. 200—44)

This invention relates to a lock structure adapted particularly for use on automotive vehicles for locking operation controls such as, for example, the steering and the ignition. The invention concerns particularly a two-stage or sequential operation type of lock, with the first stage operation effecting unlocking or release of the steering and establishing proper operating conditions for an ignition controlling switch, and the second stage operation effecting opening or closing of the ignition controlling switch. The invention covers improvements over structure disclosed in the copending application of Alexander C. Mabee, Serial No. 93,156, filed July 29, 1936.

The type of structure to which our invention is applied comprises a lock bolt element shiftable axially to locking or unlocking position by key controlled means, and a rotatable switch controlling element, usually comprising a lever, with interconnecting means adapted, when the locking bolt is in unlocking position, to establish such operative connection between the switch control element and the switch that, upon rotation of the control element, the switch may be operated for opening and closing the ignition circuit, and said interconnecting means being adapted, when the lock bolt element is in its locking position, to disconnect the switch controlling element from such operative connection with the switch so that the switch element is then free for rotative movement but without any operation of the switch to affect the circuit. In other words, when the locking bolt is in unlocking position, rotational movement of the switch controlling element will be effective to operate the switch for circuit control, but when the lock bolt is in locking position, the switch controlling element is freely rotatable but its rotation will have no effect either to open or close the ignition circuit.

It is very desirable in this type of lock structure, to prevent shifting of the locking bolt to either its locking or unlocking position while the switch actuating element is in position corresponding to circuit closing condition of the switch, and an important object of our invention is, therefore, to provide interlocking means between the lock bolt structure and the switch actuating element which means, while permitting free rotational movement of the switch controlling element during either locking or unlocking position of the lock bolt structure, will prevent shifting of the bolt structure to locking position until the switch actuating element is first moved for switch opening, and which will prevent shift of the lock bolt structure to unlocking position until the switch actuating element is first moved to position corresponding to that of switch opening.

Our invention is shown incorporated in the structure disclosed on the drawing, in which drawing:

Figure 1 is a plan view of the locking structure applied to a steering column which is shown in transverse section;

Figure 2 is a section on plane II—II, Figure 1;

Figure 3 is a section on plane III—III, Figure 2;

Figure 4 is a section on plane IV—IV, Figure 2; and

Figure 5 is a section similar to Figure 4 showing the movable switch element in another position.

The lock shown comprises a generally cylindrical body 1 having the cylindrical opening 2 therethrough at its left end for receiving the tube 3 which surrounds the steering shaft 4 of an automobile, the body being slit as indicated at 5 so that the material around the opening 2 may securely clamp the tube by tightening of a screw 6.

The body 1 has the cylindrical bore 7 registering at its inner end with a passage 8 in the tube 3. Slidable in the bore 7 is a lock bolt structure comprising the barrel 10 and the locking plunger 11, a spring 12 within the barrel urging the plunger outwardly, such outward movement being limited as by means of a pin 13 on the barrel 10 engaging the channel 14 in the plunger.

The steering shaft has a bushing 15 secured thereto provided with a hole 16, and when this hole is in axial alignment with the bore 7, and the lock bolt structure shifts outwardly, the plunger 11 will enter the hole to lock the steering shaft 4 against rotation by the steering wheel. The shifting of the lock bolt structure is controlled by the turning of a key in the keyhole 17 of a tumbler lock cylinder 18 within the lock casing 19 secured in the bore 20 in the boss 21 extending from the body 1, the lock cylinder at its inner end carrying a cam 22 engaging in the notch 23 in the lock barrel 10 so that when the key is turned the lock bolt structure may be shifted to locking or unlocking position.

The switch actuating or controlling element comprises a cylindrical hub 24 fitting and rotating in the outer end of the bore 7 and at its outer end having an arm or lever 25 by means of which it may be readily rotated, axial movement being prevented by a pin 26 extending through the wall of the body 1 and projecting into a circumferentially extending channel 27 in the hub 24.

The switch mechanism comprises a sheet metal box 28 which is secured with its base against the rear side of the body 1 and which has a cover 29

of insulating material and supporting circuit terminals 30 and 31.

Within the switch box is the movable switch member 32 in the form of an oblong block of insulating material which engages with its inner side against the bottom of the box and on its outer side supports a switch blade 33 parallel therewith and having the contact ends 34 and 35 which are held spring-pressed against the inner face of the cover 29.

The circuit controlling association of the switch blade 33 with the circuit terminals 30 and 31 depends upon the position of the locking bolt structure. The lock bolt structure body has a pin 36 extending radially therefrom through a longitudinal slot 37 in the lock housing 1 and the slot 38 in the bottom of the switch box, the end of the pin engaging in the hole 39 in the switch block 32, which hole is in alignment with the switch blade end 34, the switch block being thus shiftable longitudinally with the lock bolt structure and the pin 36 forming a pivot for rotational or swinging movement thereof. The engagement of the pin 36 in the slot 37 also holds the lock bolt structure against rotational movement.

The hub 24 of the switch actuating element has a pin 40 extending radially therefrom through the slot 41 in the lock housing 1 and the slot 42 in the switch box bottom, the end of the pin projecting into the longitudinal channel 43 in the inner side of the switch block 32 so that when the switch actuating element is rotated, the switch block will be swung laterally.

When the lock bolt structure 10 is in its steering locking position, the switch block will be held in its inner position with the pivot end 34 of its switch blade in longitudinal alignment with but out of contact with the terminal 30, the terminal 31 being then in advance of and to one side of the longitudinal path of travel of the switch block and away from the switch blade so that neither terminal is engaged by the switch blade when the lock structure is in its steering locking position. Now when the hub 24 is operated, the switch block will be correspondingly operated but there will be no engagement of the switch blade with the circuit terminals, and the circuit, such as the ignition circuit, cannot be controlled. However, when the lock bolt structure is shifted outwardly to unlocking position, the switch block is shifted longitudinally therewith to bring the pivot end 34 of the switch blade into contact with the circuit terminal 30 and the other end 35 of the blade into position at one side of the circuit terminal 31. Now when the hub 24 is rotated, the switch block will be swung to carry its outer end 35 into engagement with the circuit terminal 31 for closure of the ignition circuit. Thus, while the actuating element 24 for the switch may be freely rotated during either the locking or unlocking position of the lock bolt structure, it is only when the lock bolt structure is in unlocking position that the switch will be in effective condition for actuation thereof by the actuating element 24 for circuit control.

In order to require setting of the switch actuating element 24 for circuit opening by the switch before the lock bolt structure can be shifted back to locking position and also to require the same setting before the lock bolt structure can be shifted to unlocking position, interlocking means are provided for the lock bolt structure and the switch actuating element. As shown, the lock bolt structure barrel 10 has the cylindrical extension or neck 44 terminating in a cylindrical head 44' adapted to engage in the bore 45 of the hub 24 of the switch controlling element when the lock bolt structure is shifted to its unlocking position. The head has a slot 46 and the hub 24 has a pin 47 which is in longitudinal alignment with the slot 46 only when the switch actuating element is in position corresponding to switch open condition. When the switch actuating element is in this position, the lock bolt structure may be shifted to unlocking position as the slot 46 will then receive the pin 47 so that the extension 44 may be free to enter the bore 45. If the switch actuating element is not in position corresponding to circuit opening condition of the switch, the extension head 44' will abut the pin 47 and so prevent shift of the lock bolt structure to unlocking position.

If the switch actuating element is in proper position, the extension 44 may enter the bore 45 and when the lock bolt structure is in steering unlocking position the pin 47 will be in alignment with the cylindrical neck 44 and the switch actuating element 24 is then free for rotational movement to effect circuit controlling operation of the switch whose switch blade structure has been shifted into effective position with the lock bolt structure. Upon rotation of the switch control element to swing the switch block for closure of the circuit, the pin 47 will have been moved away from the slot 46 and shift of the lock bolt structure back to locking position will be prevented by the abutment of the head 44' against the pin. It is therefore necessary, before the steering can be relocked, that the switch actuating element be rotated back to switch opening position and to bring the pin 47 back into registration with the slot 46 to free the bolt structure for shift to its locking position. After such shift of the lock bolt structure, the pin 47 will be entirely free of the lock bolt structure and the switch controlling element 24 is freely rotatable but can accomplish no circuit control as the switch blade has been withdrawn from operative position relative to the circuit terminals 30 and 31.

In order to yieldably hold the switch actuating element 24 in its switch opening or closing setting, a spring pressed detent 48, which may be in the form of a ball, is provided for engaging in either of the notches 49 and 50 in the hub 24.

We have shown practical and efficient embodiment of the various features of our invention but we do not desire to be limited to the exact construction, arrangement and operation shown and described as changes and modifications may be made without departing from the spirit of the invention.

We claim as follows:

1. In a lock structure of the class described, a switch comprising movable and stationary elements, a locking bolt and a switch actuating member co-axial therewith, said locking bolt being non-rotatable but adapted for axial shift to locking or unlocking position, said actuating member being held against axial shift but being freely rotatable during either position of the locking bolt, said switch elements being in normal cooperative relationship for actuation by said actuating member to open or close a circuit when said locking bolt is in unlocking position, means whereby movement of said locking bolt to locking position will dissociate the switch elements where-

by actuation of the switch by the actuating member will be ineffective for any circuit control, and means preventing shift of said locking bolt to locking position unless said actuating member is in position for setting of the switch for open circuit.

2. In a lock structure of the class described, a switch comprising movable and stationary elements, a locking bolt and a switch actuating member, said locking bolt being non-rotatable but adapted for axial shift to locking or unlocking position, said actuating member being freely movable during either position of said locking bolt and independently thereof, said switch elements being in normal cooperative relationship for actuation by said actuating member for switch opening or closing when said locking bolt is in unlocking position, means whereby movement of said locking bolt to locking position will dissociate the switch elements whereby actuation of the switch by the actuating member will be ineffective for any circuit control, and means interlocking said bolt and actuating member for preventing movement of said bolt to either locking or unlocking position unless said actuating member is set for switch opening.

3. In a lock structure of the class described, a locking bolt, a switch comprising a switch blade element and switch contacts, a switch actuating member connected with said switch blade element, means whereby movement of said locking bolt to unlocking position will set said switch blade element relative to the switch contacts for movement of the switch element by said actuating member for engagement with said contacts for effective circuit control and whereby movement of said locking bolt to locking position will set said switch blade element to prevent movement thereof by said actuating member for effective circuit control, and means for preventing movement of said locking bolt to either its locking or unlocking position while said actuating member is in one of its switch actuating positions but for permitting such movement of the locking bolt when the actuating member is in the other of its switch actuating positions.

4. In a lock structure of the class described, a switch comprising movable and stationary elements, a locking bolt and a switch actuating member, said locking bolt being adapted for shift to locking or unlocking position, said actuating member being freely rotatable to either of two positions during either position of said locking bolt, said switch elements being in normal cooperative relationship for actuation by said actuating member to open or close a circuit when said locking bolt is in unlocking position, means whereby movement of said locking bolt to locking position will dissociate the switch elements whereby actuation of the switch by the actuating member will be ineffective for any circuit control, and means for preventing shift of said locking bolt from locking position toward unlocking position while said actuating member is in one of its positions but permitting such shift of the bolt when the actuating member is moved to its other position.

5. In a lock structure of the class described, a switch comprising movable and stationary elements, a locking bolt and a switch actuating member, said locking bolt being adapted for shift to locking or unlocking position, said actuating member being freely rotatable during either position of said locking bolt, said switch elements being in normal cooperative relationship for actuation by said actuating member to open or close a circuit when said locking bolt is in unlocking position, means whereby movement of said locking bolt to locking position will dissociate the switch elements whereby actuation of the switch by the actuating member will be ineffective for any circuit control, and means for preventing shift of said locking bolt from locking position toward unlocking position unless said actuating member is set in position corresponding to circuit opening position of said switch.

6. In a lock structure of the class described, a circuit controlling switch comprising movable and stationary elements, a locking bolt and a switch actuating member, said locking bolt being shiftable into locking or unlocking position, said actuating member being freely rotatable during either position of said locking bolt, said switch elements being in normal cooperative relationship for actuation by said actuating member for circuit opening or closing when said locking bolt is in unlocking position, means whereby movement of said locking bolt to locking position will dissociate the switch elements whereby actuation of the switch by the actuating member will be ineffective for any circuit control, and stop means controlled by said actuating member for preventing movement of said locking bolt from locking to unlocking position unless said actuating member is set in position corresponding to that of switch opening.

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