May 5, 1953 R. M. CRITCHFIELD ET AL 2,637,789

SWITCH

Filed March 28, 1947 2 SHEETS—SHEET 1

Fig. 1

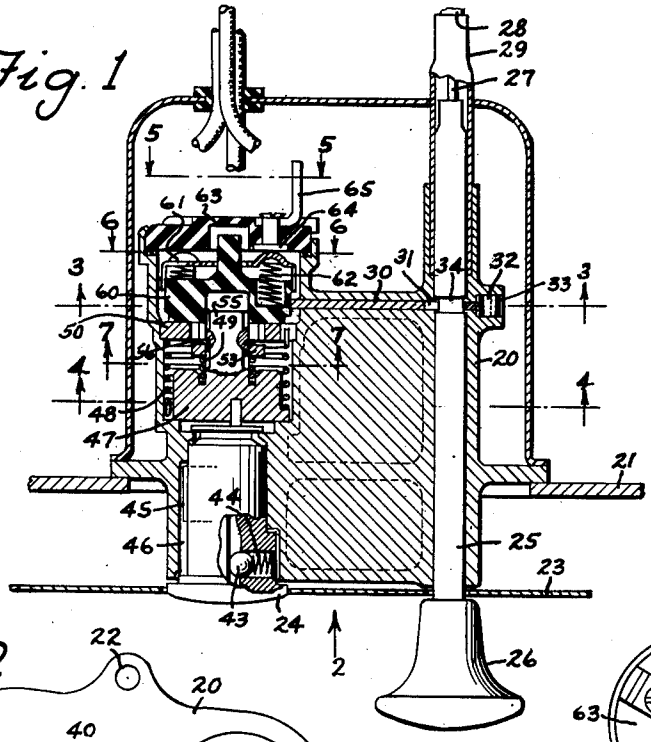


Fig. 2

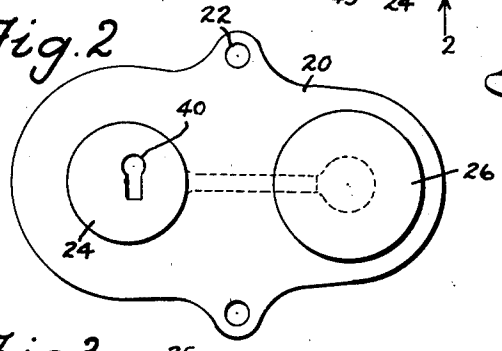


Fig. 3

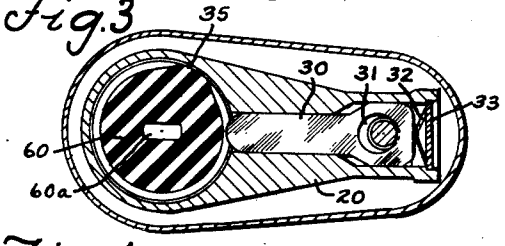


Fig. 4

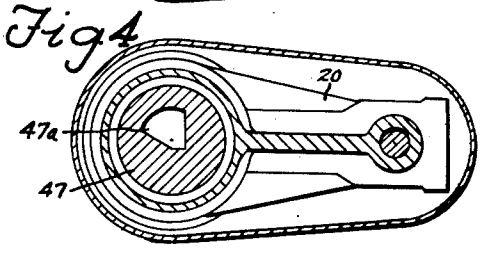


Fig. 5

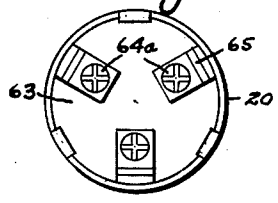


Fig. 8

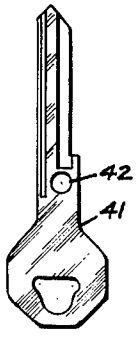


Fig. 6

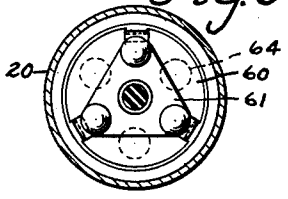
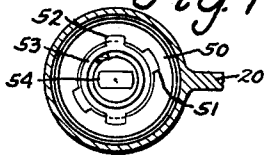


Fig. 7



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SWITCH

Filed March 28, 1947 2 SHEETS—SHEET 2

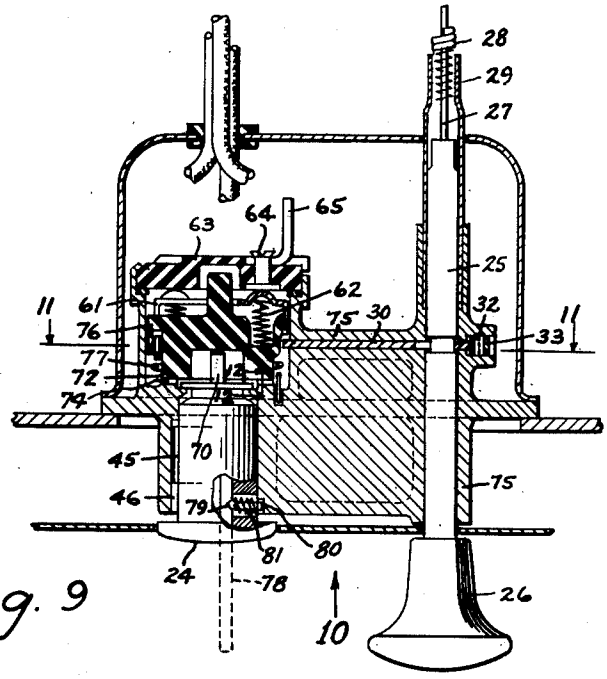


Fig. 9

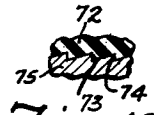


Fig. 12

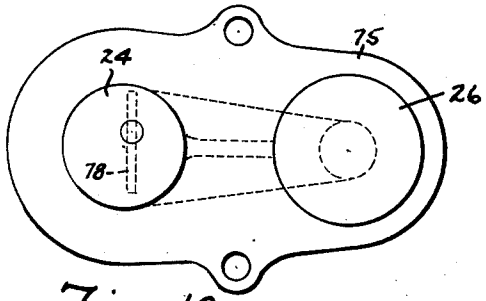


Fig. 10

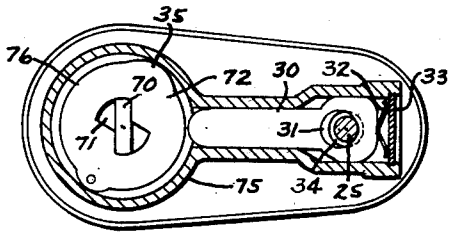


Fig. 11



Fig. 13
LOCKED
IGNITION OFF
KEY OUT

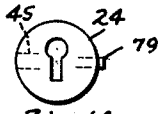


Fig. 14
UNLOCKED
IGNITION OFF
KEY IN



Fig. 15
UNLOCKED
IGNITION ON
KEY IN

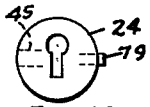


Fig. 16
UNLOCKED
IGNITION ON
KEY IN
LOCK BARREL
IN KEY REMOVAL
POSITION

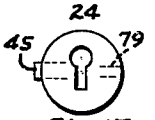


Fig. 17
LOCKED
IGNITION ON
KEY OUT

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Patented May 5, 1953

2,637,789

UNITED STATES PATENT OFFICE

2,637,789

SWITCH

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Application March 28, 1947, Serial No. 737,968

9 Claims. (Cl. 200—44)

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This invention relates to a theft preventing device for use on automobiles.

An object of the invention is to insure that the ignition key will be removed when the ignition is turned off. In order to accomplish this the invention provides that the key must be removed before the ignition can be turned off. In both forms of the invention herein disclosed, the insertion of the key in the lock makes it possible to turn on the ignition by rotating the key. A ratchet device holds the switch in "on" position. A torsion spring which is additionally stressed when the ignition is turned on biases the ignition switch to "off" position, but the movable switch contact can not turn to "off" position due to the ratchet or latching device. The release of the latching device or ratchet is conditioned upon removal of the key. In one form of the invention the removal of the key releases the latching device. In another form the removal of the key makes it possible to press the latch in order to release the latching device.

A further object of the invention is to provide for locking the hood latch control member in such position that the hood can not be raised while the ignition is locked.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein a preferred embodiment of the present invention is clearly shown.

In the drawings:

Fig. 1 is a sectional view of the embodiment wherein the removal of the key releases the latching device;

Fig. 2 is a view in the direction of arrow 2 of Fig. 1;

Figs. 3 to 7 are sectional views taken respectively on lines 3—3, 4—4, 5—5, 6—6 and 7—7 of Fig. 1;

Fig. 8 is a view of the key;

Fig. 9 is a sectional view of an embodiment wherein the removal of the key makes it possible to press the locked cylinder so as to release the latching device;

Fig. 10 is a view in the direction of the arrow 10 of Fig. 9;

Fig. 11 is a sectional view on the line 11—11 of Fig. 9.

Fig. 12 is a fragmentary sectional view on the line 12—12 of Fig. 9, and is drawn to a larger scale.

Figs. 13 to 17 are diagrams showing the operation of the embodiment shown in Fig. 9.

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Referring to Fig. 1, 20 designates a body or frame which is mounted on a bracket 21 by screws (not shown) passing by the frame. In front of bracket 21 an instrument panel 23 is located having holes receiving a lock cylinder 24 and a hood latch control rod 25 having a handle 26. Rod 25 extends through the frame and is attached to a Bowden wire 27 movable within a tube 28 attached at one end to a sleeve 29 supported by the frame. When the knob 26 is pushed into the position shown in Fig. 1, the hood latch is locked. The rod 25 is maintained in the locking position by a movable element or latch bar 30 having a hole 31 through which the rod 25 extends. The hole 31 is larger than the rod 25. A spring 32 retained by a disc 33 urges the bar 30 to the left so that it is pushed into an annular groove 34, provided by the rod 25. When the ignition is turned on in a manner to be described, a cam lobe 35, see Fig. 3, moves clockwise to push the bar 30 to the right so that the center of the hole 31 is aligned with the center of the rod 25. The lock cylinder 24 provides the keyhole 40 for receiving a key 41 having tumbler notches (not shown). Key 41 has a hole 42 for receiving a ball 43 urged left by a spring 44. The function of the ball 43 is to keep the key 41 in the lock cylinder 24 against the pressure of the other springs to be described. When the key 41 is pushed into the lock cylinder 24 far enough it will stay in under the action of the ball 43. A side bar 45 is retracted from a groove 46 formed in the frame 20 so that the lock cylinder can be turned. The key 41 is of such length that when inserted in the lock cylinder 24 and retained by the ball 43 it engages a rotor 47 and moves it up, as viewed in Fig. 1, thereby compressing springs 48 and 49. The spring 48 is a torsion spring and is anchored at one end to the rotor 47 and at the other end to a latch plate 50. The latch plate 50 has side catches 51, see Fig. 7, extending from a central hole for the purpose of receiving lugs 52 of latch rotor 53 which has an oblong hole 54 therein surrounding a similarly shaped stem 55 of rotor 47. A split washer 56 which is spun into a groove of stem 55 limits upward movement of the latch rotor 53 against the action of spring 49. The placing of the key in the lock cylinder as described causes the rotor 47 to move up sufficiently to press the latch rotor 53 against the latch plate 50 and additionally to compress the spring 49. When the key is turned to turn on the ignition lock cylinder 24, the rotor 47 and the latch rotor 53 are turned and the spring 49 snaps the lugs 52 into the notches 51 of the latch plate

thereby holding the rotor 47 in the position in which it was turned against the action of the torsion spring 48 which tries to turn the rotor 47 back to the starting position. The turning of lock cylinder 24 by the key causes the turning of a contact carrier 60 having a recess 60a with flat sides to fit the stem 55 of the rotor 47. Carrier 60 supports a triangular movable contact 61 having three buttons respectively urged by springs 62 toward the switch back or stationary contact support 63 which carries the stationary contacts 64 provided by rivets 64a which secures to the part 63 terminal members 65, one of which is respectively connected to the battery, the ignition circuit, and an auxiliary circuit such as the gasoline gauge. The carrier 60 provides the cam 35. The ignition is latched in "on" position due to the cooperation of the parts 50 and 53. To turn off the ignition it is necessary to rotate the lock cylinder 24 to starting position so that the side bar 45 is in radal alignment with the slot 46. The cylinder 24 returns to starting or "off" position but the rotor 47 still remains in "on" position before the key is removed from the lock cylinder. Removal of the key from the lock cylinder permits expansion of spring 48 in order to retract the latch rotor 53 from the latch plate 59 whereupon the spring 48 untwists to cause the rotor 47, contact carrier 60 and contact 61 to return to "off" position.

While the carrier 60 was in "on" position its cam 35 pressed against bar 30 to align plate hole 31 with the rod 25 so that the hood latch could be operated. After the key has been removed from the lock and the ignition is automatically turned off by the spring 48 the cam 35 is located as shown in Fig. 3, which permits the leaf spring 32 to push the bar 30 into rod lock position.

In the form shown in Fig. 9, the cylinder 24 has a rectangular projection 70 received by a hole 71 in a rotor 72 having ratchet teeth 73 for engaging stationary ratchet teeth 74 provided by the frame 75. The rotor 72 has an enlarged portion 76 and carries the movable contact 61. The enlarged portion 76 provides the cam lobe 35 described with reference to Fig. 3. A torsion spring 77 having one end connected with the enlarged portion 76 and the other end connected with the frame 75 resists the turning of contact 61 into the "circuit on" position. When a key 78 is placed in the lock the side bar 45 is retracted from the groove 46 so that the lock cylinder 24 may be turned and the key 78 forces a plunger pin 79 toward the right and into an arcuate groove 80 of frame 75. The function of pin 79 is to prevent longitudinal movement of the lock cylinder while the key is in the lock cylinder. The ignition is turned on by turning the key 78 and is latched on due to the cooperation of the ratchet teeth 73 and 74 which are maintained in engagement by the springs 62 which also urge the contact 61 toward the stationary contact support 63. The ignition switch is latched on against the action of the torsion spring 77 which is additionally wound by turning on the ignition. In order to turn off the ignition it is necessary to separate the ratchet teeth 73 from the ratchet teeth 74 by upward movement of the rotor 72. This can be effected by upward movement of lock cylinder 24 but lock cylinder 24 can not be moved while the key is in the lock cylinder because the key projects the pin 79 into the groove 80. When the key 78 is removed from the lock cylinder a spring 81 retracts the pin from the groove so that the lock cylinder can be pushed forward in order to separate the ratchet teeth 73, 74 so that the torsion spring 77 will return the contact 61 to "off" position.

While the embodiment of the present invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. An ignition switch having a rotary contact movable to "off" and "on" positions; a key operated cylinder for turning the contact to an "on" position; a torsion spring resisting turning of the contact to "on" position and operable, when released, to turn the contact to an "off" position; a latch for holding the contact in "on" position when turned by the key, a spring pressed member for holding the key within the cylinder and maintaining the latch effective and an axially shiftable member rendered operable by removal of the key to disengage the latch.

2. An ignition switch according to claim 1 in which the axially shiftable member is spring actuated to disengage the latch in response to movement of the key from the cylinder.

3. An ignition switch according to claim 1 in which the axially shiftable member is one which, in response to removal of the key, is rendered manually operative to disengage the latch.

4. An ignition switch having a rotary contact movable to "off" and "on" positions; a lock cylinder rotatably supported relative to the movable contact; a rotor mounted for axial and rotary movements; a latch provision provided by a stationary plate for receiving a latch provision provided by the rotor; a torsion spring having one end anchored to plate and having the other end anchored to the rotor for resisting turning of the contact to "on" position and operable when released to turn the contact to "off" position; a key for the lock cylinder but of sufficient length to extend into a slot provided by the rotor to drive same and also to move the rotor axially and compress the torsion spring so that when the rotor is turned by the key against the action of the torsion spring to move the contact to "on" position and the latch provision of the rotor to register with the latch provision of the plate the spring will expand to move the latch provision of the rotor into engagement with the latch provision of the plate to hold the contact in "on" position, said latch provisions being disengaged when the key is partially removed from the cylinder and thereby permit the spring to return the movable contact to "off" position.

5. An ignition switch having a rotary contact movable to "off" and "on" positions; an axially shiftable member having a slot; latch provisions provided by a stationary part and the shiftable member; a compression spring between the shiftable member and the contact; a torsion spring having one end anchored and having the other end anchored to the shiftable member to resist turning of the movable contact to "on" position and operable when released to turn the contact to "off" position; a lock cylinder and a key therefore, said key extending through the cylinder a sufficient length to extend into the slot of the shiftable member and also to move axially the shiftable member to compress the springs so that upon turning of the key a predetermined angular movement the compressed spring will snap the latch provision of the shiftable member into engagement with the latch provisions of the stationary part to hold the movable contact in

"on" position against the action of the torsion spring; and a spring pressed member for yieldingly holding the key within the cylinder and maintaining the latch provision effective.

6. An ignition switch having a yieldable rotary contact movable to "off" and "on" positions; a key operated cylinder rotatably and longitudinally supported relative to the contact for turning the contact to "on" position; a torsion spring having one end anchored to the movable contact and having the other end anchored to a stationary part resisting turning of the contact to "on" position and operable when released to turn the contact to "off" position; ratchet provisions between the movable contact and a stationary part for holding the contact in "on" position when turned by the key with the yieldable contact functioning to maintain the ratchet provisions effective, said ratchet provision being rendered ineffective when said key is removed from the cylinder and the cylinder is moved axially against the action of the yieldable contact to disengage the ratchet provisions and permit the torsion spring to return the contact to "off" position.

7. An electric switch comprising, a bored casing, a lock cylinder rotatable in the bore and accessible at the front of the casing; a closure carrying fixed contacts extending across the bore remote from the cylinder; a carrier rotatable within the bore and carrying a movable contact for bridging the fixed contacts; a fixed plate within the bore and disposed between the carrier and cylinder; a driver for the carrier rotatable within the bore; a splined connection between the driver and the carrier whereby the driver and carrier rotate together; a movable plate slidably supported on the splined connection; a coiled spring between the movable plate and driver for pressing the movable plate against the fixed plate; a torsion spring having one end anchored to the driver and having the other end anchored for resisting the turning of driver to rotate the carrier to "on" position; a key adapted to extend through cylinder and project into a slot provided by the driver to drive same and also to move the driver in a direction to compress the springs so that when the driver is rotated by the key to move the carrier to "on" position the coiled spring operates to move the movable plate in a direction to cause latch provisions provided by the movable plate to register with latch provisions provided by the fixed plate and hold the carrier in "on" position; and a biased member carried by the cylinder for cooperation with the key to hold the key within the cylinder against the action of the springs to maintain the latch provisions effective when

and so long as the key is so held, said latch provision being disengaged by the coiled spring when the key is manually removed from the cylinder to allow the torsion spring to move the driver and carrier to the "off" position of the switch.

8. An ignition switch having a rotary contact movable to "off" and "on" positions; a rotatable and axial movable member; means interconnecting the member and the contact to transmit rotary movement from the member to the contact; stationary latch provisions; a torsion spring having one end fixed and having the other end connected to the member for resisting turning of the member to move the contact to "on" position and operable, when released, to turn the member and the contact to an "off" position; a compression spring between the member and the latch provisions carried by the interconnecting means; a lock cylinder; a key for the lock, said key extending through the cylinder so as to be interconnected with the member to transmit axial and rotary movements to the member and to further compress the compression spring so that when the key is turned to rotate the member to turn the contact to "on" position said compression spring will move the latch provisions on the interconnecting means into registry with the stationary latch provisions to hold the contact in "on" position against the action of the torsion spring, and a spring pressed member for yieldingly holding the key within the cylinder and maintaining the latch provisions effective.

9. A locking device comprising, a member movable to and from an operative position, a key receiving member having a connection with the movable member and adapted upon rotation by a proper key inserted therein to move the movable member toward the operative position; resilient means resisting movement of the members to the operative position and operable, when released to move the members to their non-operative positions; latch means for holding the movable member in operative position and means yieldably holding the key in the key receiving member so that latch means is effective to hold the movable member in its operative position.

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JOHN W. LAWSON.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,664,110	Jacobi	Mar. 27, 1928
1,714,426	Kuepfer	May 21, 1929
1,835,303	Jacobi	Dec. 8, 1931
2,033,252	Parker	Mar. 10, 1936
2,314,568	Wharam	Mar. 23, 1943