Dec. 7, 1965 C. H. SCOTT 3,222,534

ELECTRICAL ELEMENT AND SWITCHING MEANS

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Fig. 1.

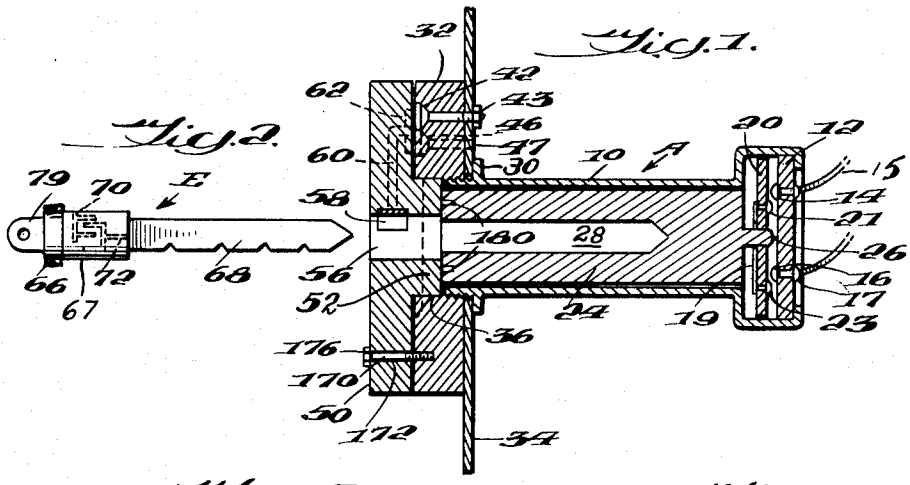


Fig. 2.

Fig. 3.

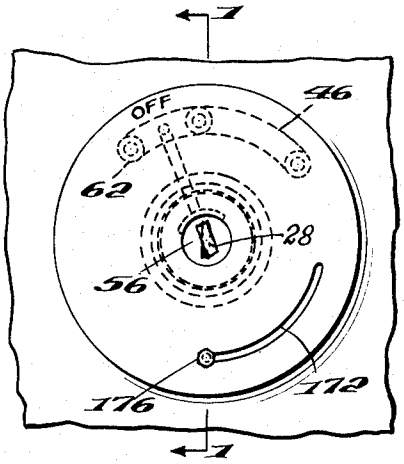
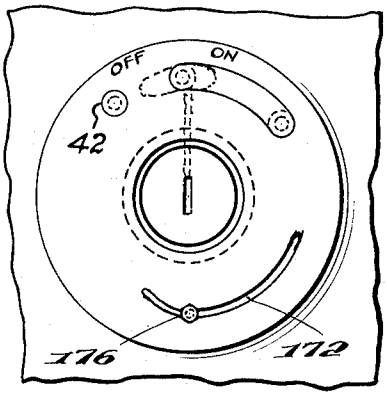


Fig. 4.



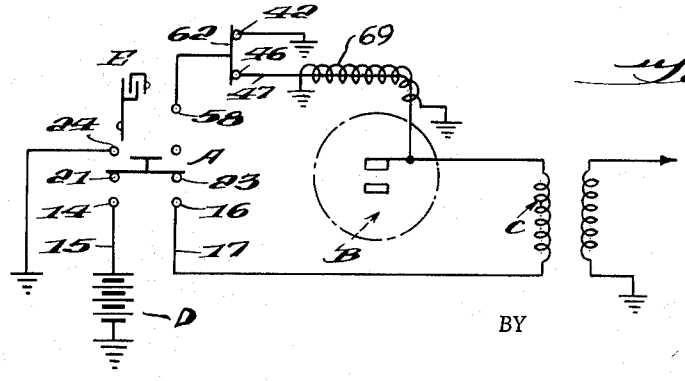


Fig. 5.

INVENTOR
CHARLES H. SCOTT

BY George Wakellard

ATTORNEY

Dec. 7, 1965 C. H. SCOTT 3,222,534

ELECTRICAL ELEMENT AND SWITCHING MEANS

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Fig. 8.

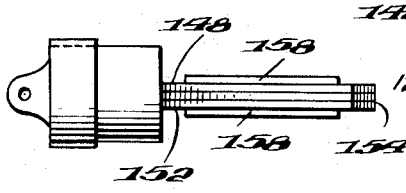


Fig. 6.

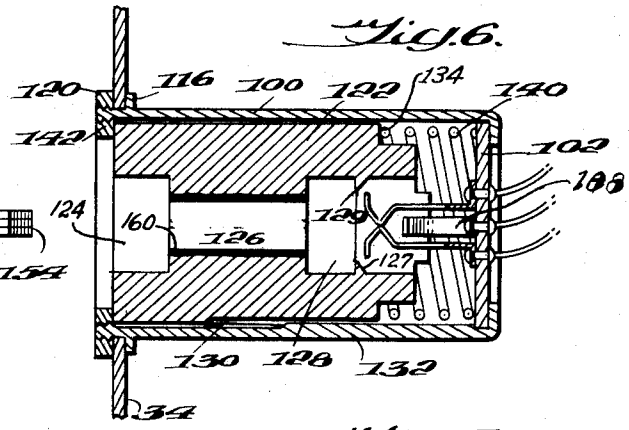


Fig. 7.

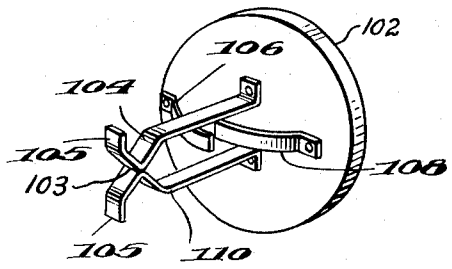


Fig. 9.

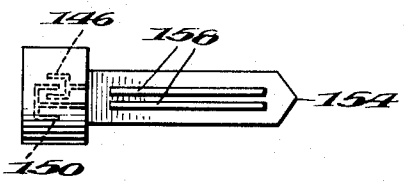
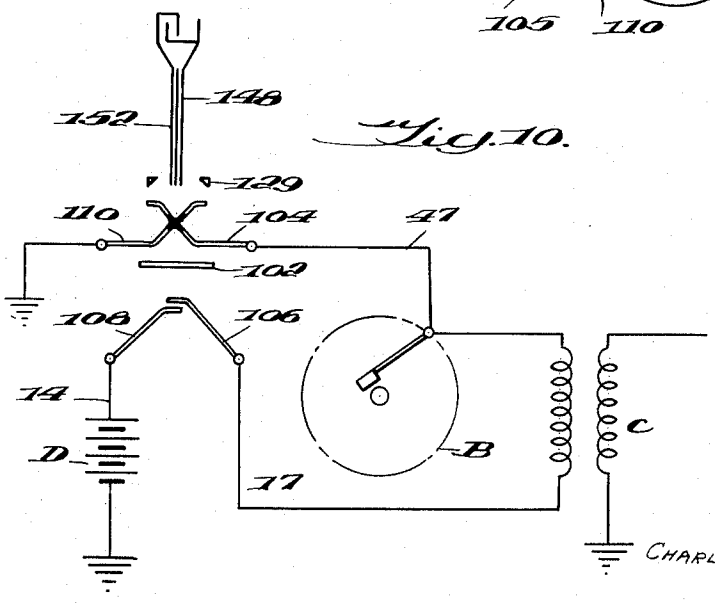


Fig. 10.



INVENTOR
CHARLES H. SCOTT

BY George R. Rabillard
ATTORNEY

United States Patent Office

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ELECTRICAL ELEMENT AND SWITCHING MEANS

Charles H. Scott, 71 Weston Ave., Braintree 84, Mass.

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9 Claims. (Cl. 307—10)

The invention disclosed herein relates to ignition systems and more particularly to the type used in conjunction with an internal combustion engine such as that in an automobile.

The principal object of the invention is to provide an ignition system wherein one of the electrical components is used as the keying device for the switching means, whereby the switching means not only functions to make and break the circuit, but becomes a part thereof.

Flowing from the principal object is the resultant object that, when incorporated in an ignition system of an internal combustion engine, it renders the latter practically theftproof. This is so because, upon removal of the keying means, one electrical component of the system is removed, rendering the system incomplete.

It is recognized that numerous attempts have been made to theftproof automobiles by modification of the ignition system, as for example, by adding an element thereto as shown in Brown U.S. Patent No. 2,461,196; or by positioning an element so it will be inaccessible, as shown in Diehl U.S. Patent No. 2,833,841. Modifications have also been made in the switching means as by utilizing the key as a spanning contact, as shown in Wagner U.S. Patent No. 2,105,304; or by special locking arrangements such as shown in Hemingway U.S. Patent No. 1,660,675.

So far as can be ascertained the concept of employing one of the electrical components of an ignition system, as a removable electrical keying means, has not heretofore been suggested or accomplished.

In addition to the aforementioned objects, a further object is that the invention lends itself to the manufacture of switching means which, from an operator's point of view, are substantially foolproof, in that once the keying means is removed, the circuit is incomplete, regardless of the position of the switching means.

The foregoing and other objects of the invention will be readily understood from the following, when read in light of the accompanying drawings, wherein:

FIGURE 1 is a cross sectional view of one embodiment of the invention as incorporated in locks now in use;

FIGURE 2 is a view, partly diagrammatic, of the electric keying element;

FIGURE 3 is an end view of FIGURE 1, as seen from the front of the switching means, with the switching means in "off" position;

FIGURE 4 is a view similar to FIGURE 3 with the switching means in "on" position;

FIGURE 5 is a schematic view of the circuitry of the ignition system, utilizing the device of FIGURES 1 to 4;

FIGURE 6 is a cross sectional view of a second embodiment of the invention;

FIGURE 7 is a perspective view of the terminal arrangement within FIGURE 6, but turned at right angles thereto;

FIGURE 8 is a side view of the electrical keying element for the embodiment of FIGURE 6;

FIGURE 9 is a top view of FIGURE 8; and

FIGURE 10 is a schematic view of the circuitry, utilizing the device of FIGURES 6 to 10.

Referring to FIGURES 1 to 5 there is disclosed the preferred embodiment inasmuch as substantially all switching means or locks, now in use on automobiles, may be reconstructed to incorporate the present invention.

As shown, there is provided an ignition system having a switching means A, and the usual electrical components, namely a circuit breaker B, a coil C, and a battery D. Herein the circuit breaker B does not have a condenser associated therewith, the condenser being incorporated in the keying means E.

Referring to the switching means A, it includes a cylindrical casing **10**, having a rear end closure **12** of any suitable nonconducting material. The closure **12** carries spaced terminals **14** and **16** on the inner face thereof which extend through the closure and connect to leads **15** and **17** running to the battery and one end of the coil respectively. Forward of end closure **12** is a rotatable member **20** also of nonconducting material and which carries a spanning contact **19** having end terminals **21** and **23**. The terminals **21** and **23** engage terminals **14** and **16** when the switching means is in "on" position, and are moved out of engagement therefrom when in "off" position. These cooperating terminals **14**, **16**, **21** and **23** constitute the switch for making or breaking the circuit portion between battery D and coil C.

Rotatably mounted within casing **10** is a cylindrical metal barrel **24**, having a forward key receiving slot **28**, and a rearwardly extending finger **26** which projects into a slot in the member **20** for rotating it from "off" to "on" position upon similar rotation of barrel **24**. The switching means is mounted on the dash panel **34**, the casing having, adjacent its forward end, an outwardly extending circumferential shoulder **30** with a larger outside diameter than an opening in the panel; and forward of the shoulder **30**, the casing projects through the opening and is threaded to receive a threaded base plate or ring member **32** which secures the switching means in position on the panel.

Except for ring member **32** the switching means described is the type presently installed in a "Chevrolet" automobile. For this reason, the key actuated tumblers which lock the barrel, the terminals and circuits as those for the radio, the means for resetting the barrel from "start" to "on" position, and the catch for retaining barrel **24** within casing **10**, have all been omitted as not being essential to an understanding of the invention, and which may readily be added by one having ordinary skill in the art. Obviously any standard lock may be used, the "Chevrolet" type having been illustrated as it was used in actually reducing this embodiment of the invention to practice.

Herein the ring member **32** is of nonconducting material and has a central opening **36** of like diameter to casing **10**. The rear portion of the wall defining opening **36** is threaded for mounting it on the threaded end of casing **10**, and the forward wall portion constitutes a bearing for an overlying face plate or second ring member **50**.

The second ring member **50**, which has a central key opening **56** therethrough, is also of nonconducting material, and has the same outside diameter as member **32**. Extending from the rear surface of member **50** is bearing portion **52**, of such diameter that it fits closely within the central recess **36** of ring member **32**. The rear surface of the bearing portion **52** is secured to barrel **24** by an epoxy cement, thus making them integral for simultaneous movement, and providing a barrel having a portion of nonconducting material and a portion of conducting material. When so secured the central key opening **56** is aligned with key slot **28** for receiving the proper keying means.

Mounted on the wall defining the opening **56** of ring member **50** is a metal terminal **58**, connected by a conductor **60** to a metal terminal **62** on the rear surface of member **50** outwardly from the bearing portion **52**. Mounted opposite to terminal **62**, on the front surface of

ring member 32, is a metal terminal 46, which is connected by an insulated lead 47 to the circuit breaker B, the lead then continuing to the end of coil C. The terminal 46 is of such arcuate length that it will be engaged by terminal 62 in both the "on" and "off" position of the switching means (FIGS. 3 and 4).

The terminal 62 has sufficient arc so that when it is in "off" position, it connects terminal 46 to a ground terminal 42 mounted in the face of ring member 32. The ground terminal 42 is shown as a metal bolt having its head flush with the forward surface of member 32, and its stem extending through the member and an opening in dash panel 34, the end of the bolt being threaded to receive a nut 43 for securing and grounding it against the panel.

Herein the electrical keying means B, for rotating the switching means from "off" to "on" position is a rigid member having a metal grip portion 66 and a metal bayonet portion 68. Enclosed within the keying member is a condenser having one pole 70 running to the outer metal face of the grip portion, and the other pole 72 connected to the metal bayonet portion. The grip portion 66 shown is a condenser having an exterior metal casing, and is one of the type manufactured by the Lucas Company of England, and used in the circuit breaker of a Triumph automobile. This type of condenser is approximately five-eighths of an inch in diameter and three-quarters of an inch long, and was used in actually reducing this embodiment of the invention to practice.

The metal bayonet member 68 is insulated from the casing, and thus the casing constitutes one external terminal for the condenser and the bayonet member the other external terminal. Although not essential, the end of the grip portion 66 may be provided with a cap 79 of nonconducting material. It is apparent that the keying means may be of any rigid material, such as plastic, with a condenser encased therein and having leads running from the poles of the condenser to spaced external terminals on the surface of the keying means.

Assuming the parts to be in the positions shown, the circuit is not only open but incomplete as it lacks one essential electrical component, in this instance, the condenser. Thus, the placing of a jumper across the battery-coil leads 15 and 17 would close the battery-coil circuit portion only, but the circuitry would still be incomplete. Upon insertion of the condenser-keying element in the switching means, bayonet member 68 enters barrel slot 28 and the grip portion 66 enters recess 56 of member 50. The circuitry is now complete, as the terminal 58 in recess 56, engages one terminal (the casing) of the condenser, and the other terminal (the metal bayonet) is grounded on barrel 24. The terminal 58 and the barrel thus constitute a second switch within the switching means, and the switching means is an integral part of the circuitry.

With the described arrangement, upon moving the switching means from "off" to "on" position, terminal 62 is moved out of engagement with ground terminal 42, but remains in engagement with circuit breaker terminal 46, and terminals 21 and 23 are moved into engagement with terminals 14 and 16 to close the circuit between the battery and coil completely closing the circuit and rendering it operative. Should the keying means be removed, without returning the switching means to "off" position (as can be done with the type of lock shown), the circuit is rendered inoperative as it becomes incomplete.

Because of the positioning of the condenser remote from the circuit breaker, it is desirable to place a shielding 69 around circuit breaker lead 47.

It is apparent that switching means now in use on most automobiles may readily be reconstructed to incorporate the invention herein. The addition of the ring members 32 and 50 does not require any structural changes in the casing 10 or the barrel 24 and the device, from the point of view of the user, is not changed.

Referring now to FIGURES 6 to 10, there is shown a switching means which may be used as a replacement for switches now in use or for original installations. This embodiment has not been actually reduced to practice.

The various components have been given the same letters as in the first embodiment, as the circuitry is similar. Herein, there is shown a metal casing 100, having an end closure 102 of nonconducting material. Mounted on the inner face of end closure 102, is a circuit breaker terminal 104, a coil terminal 106, a battery terminal 108, and a ground terminal 110. (See FIGURE 7.) The terminals are all made of flexible conducting materials and are secured to closure 102 by metal studs which extend therethrough and connect to the leads running to the electrical components, except for ground terminal 110 which is grounded to the casing.

The forward end of casing 100 has an outwardly projecting circumferential shoulder 116 which abuts against panel 34, with the forward threaded end of the casing projecting through an opening in the panel, to receive a locking ring 120 for securing it in position.

Positioned within casing 100 is a barrel 122 of nonconducting material, the barrel having a longitudinal opening extending therethrough to provide a forward cylindrical recess 124, a rearwardly extending slot 126, and a cylindrical terminal recess 128. The outer surface of the barrel may be provided with one or more longitudinal grooves 130 which override ridges 132 on the inner surface of the casing to position it and prevent rotation. The rear end of the barrel 122 has a reduced outside diameter to provide a spring receiving abutment 134, for positioning the forward end of a light spiral spring 140, the rear end of the spring being positioned against the end closure 102. The spring normally urges barrel 122 forwardly into engagement with a locking ring 142 screw threadedly mounted on the forward inner surface of casing 100. The barrel 122 is shorter than the casing 100, and is capable of longitudinal movement from forward "off" to rearward "on" position.

The electrical keying means E (FIGURES 8 and 9), differs from that used in the first embodiment, in that the bayonet portion comprises two metal laminates 148 and 152, which are separated and insulated from one another by a laminate 154, of any suitable nonconducting material. One pole 146 of the condenser connects to laminate 148, and the other pole 150 to laminate 152. Thus, as in the first embodiment, the condenser is encased within the keying means and is provided with spaced external terminals. The metal laminates may be provided with one or more longitudinal flukes 158 which match with grooves 160 in the barrel slot 126, the number being varied in different switching means to prevent interchangeability of keying elements.

With the keying means so constructed, upon insertion into the barrel 126, the inner end of the bayonet will enter between terminals 104 and 110 and place the condenser in circuit. As best seen in FIGURE 7, the flexible terminals 104 and 110 are spring arms projecting forwardly from closure 102 into recess 128. Each arm is provided, adjacent its forward end, with an inwardly projecting V section 103, and the outer end of each V has an upwardly projecting latching finger 105. In the preferred arrangement, before insertion of the keying means, terminals 104 and 110 are normally in engagement and the circuit breaker is grounded.

The terminals 106 and 108 are also spring arms extending forwardly from closure 102, with the end of the terminal 106 overlying the end of terminal 108. The terminals 106 and 108 constitute the first switch within the switching means, and the terminals 104 and 110 the second switch, so that herein, as in the first embodiment, two switches are provided within the switching means.

As previously stated upon insertion of the electrical

keying means the metal laminates **148** and **150** will engage the terminals **104** and **110** and place the condenser in circuit to complete the circuitry. Upon pushing in on the barrel from "off" to "on" position, the rear of the barrel will engage terminal **106** and flex it into engagement with terminal **108** thus making the circuit operative.

As the barrel **122** is moved rearwardly, the cammed rear face **127** of a circumferential shoulder **129** in recess **128** will engage fingers **105** which have been moved into its path by the spreading of terminals **104** and **110** upon insertion of the key. Continued movement of the barrel will flex latching fingers **105** rearwardly until the shoulder passes over same, whereupon the fingers will flex to perpendicular in front of the latching shoulder and prevent the barrel from moving forwardly upon release of the pushing pressure. Obviously upon removal of the key, terminals **104** and **110** will flex inwardly releasing the latching means, whereupon spring **140** will urge the barrel to "off" position, whereupon terminals **106** and **108** will break and open the battery-coil circuit.

From the foregoing, it is apparent that in each embodiment two switches are provided within the switching means, the closing of the one switch completing the battery-coil circuit, and the other placing the key condenser in circuit. In each embodiment the circuit breaker is grounded, whether or not the condenser is in circuit.

In order to assure proper alignment of the parts when reconstructing existing locks, the rear plate or ring member **32** is provided with a forwardly extending threaded pin **170** which projects through an arcuate slot **172** in the front plate or ring member **50**, its forward end receiving a locking nut **176**. As best seen in FIGURES 3 and 4, the slot **172** and pin **170** are so positioned, that movement of front ring **50** is permitted to the various settings desired. Additionally the rear face of ring member **50** may have one or more rearwardly extending pins **180** (FIGURE 1) extending into openings therefore drilled in the forward end of the metal barrel portion **24**. With a proper friction fit, the need for epoxy cement to secure the barrel portions may be eliminated.

Although ring member **32** is shown as being screw threadedly mounted onto the end of casing **10**, the casing **10** could be secured by a locking ring **120**, as in the second embodiment, with the member **32** recessed to overlie same, inasmuch as the member **32** is also secured to the panel **34** by the bolt and nut **43**.

It is equally apparent that many changes could be made, as for example in the device of FIGURE 1, the ring members could be of metal, with the terminals properly insulated therefrom. In the second embodiment the keying means could be plastic and the barrel of metal with the forward face of terminal **106** insulated where it is engaged by the barrel.

The above and other changes could be made without departing from the invention as defined in the claims.

What is claimed is:

1. A switching device for an ignition system having a casing, a metal barrel movable in the casing from an "off" to an "on" position, said barrel having a key slot therein, a ring member of nonconducting material mounted on the forward end of the casing and having a central opening therein, a terminal on the front surface of said ring member, a second ring member of nonconducting material overlying said first ring member and having a rearwardly extending portion mounted in the central recess of the first ring member, means securing the rearwardly extending portion to the barrel for movement therewith, said second ring member having a central key opening therein aligned with the barrel key slot, a terminal in the wall of said second ring member central key opening, a second terminal on the rear surface of the second ring member engageable with the terminal of the first ring member, and a conductor interconnecting the terminals on the second ring member.

2. The device defined in claim **1** including, keying means insertable within said barrel slot, a condenser within said keying means, a pair of terminals on the key exterior connecting to the condenser, one of said key terminals engaging the terminal in the wall of the second ring member, and the other engaging the metal barrel.

3. In a switching device for an ignition system, a casing, a barrel of nonconducting material longitudinally movable in the casing from a forward "off" to a rearward "on" position, a key slot extending through the barrel, a first pair of terminals mounted in the casing rearwardly of the barrel and aligned with the key slot, a second pair of normally open terminals mounted in the casing, a key insertable within the key slot and extending beyond the barrel to engage said first set of terminals, and means operable upon movement of the barrel from forward "off" position to rearward "on" position to close said second pair of terminals, and including latching means operable upon movement of the barrel from "off" to "on" position to latch it in "on" position including latching means operable upon movement of the barrel from "off" to "on" position to latch it in "on" position.

4. In a switching device for an ignition system of the character described, a metal casing, an end closure of nonconducting material for one end of the casing, a barrel of nonconducting material within the casing, said barrel being of lesser length than the casing, whereby the barrel may be moved longitudinally therein, said barrel having a key slot extending therethrough, means limiting the forward movement of the barrel, spring means normally urging the barrel to its forward position, a first pair of terminals in the casing positioned rearwardly of the barrel, said terminals being in closely spaced relationship, a key insertable in the key slot and extending therethrough, to engage both terminals, a second set of terminals positioned rearwardly of the barrel, one of said second set of terminals being in the path of movement of the barrel and being movable into engagement with the other terminal, whereby upon rearward movement of the barrel said terminals will be closed, all of said being mounted on the end closure.

5. The invention defined in claim **4** including latching means operable upon rearward movement of the barrel to retain the barrel in rearward position.

6. In a switching device for an ignition system, a casing, a barrel of nonconducting material longitudinally movable in the casing from a forward "off" to a rearward "on" position, a key slot extending through the barrel, a first pair of terminals mounted in the casing rearwardly of the barrel and aligned with the key slot, a second pair of normally open terminals mounted in the casing, a key insertable within the key slot and extending beyond the barrel to engage said first set of terminals, and means operable upon movement of the barrel from forward "off" position to rearward "on" position to close said second pair of terminals, and wherein said first pair of terminals are normally closed flexing members opened upon insertion of the key, and cooperating means on said flexing members and barrel for latching the barrel in "on" position wherein said first pair of terminals are normally closed flexing members opened upon insertion of the key, and cooperating means on said flexing members and barrel for latching the barrel in "on" position.

7. A switching device for an ignition system having a casing, a barrel movable in the casing from "off" to "on" position, said barrel having a key receiving slot therein, a first pair of terminals accessible to a key insertable in the keying slot, one of said terminals being insulated from the casing and extending exterior therefrom, the other of said terminals being grounded, keying means insertable in said slot, a condenser in said keying means and connecting to spaced terminals on the key, said key terminals engaging said first pair of terminals upon insertion of the key, a second set of normally open termi-

nals in said casing, and means operable upon movement of the barrel from "off" to "on" position for closing said second set of terminals.

8. The switching device defined in claim 7 wherein both said first set of terminals are grounded when the barrel is in "off" position.

9. A switching device for an ignition system including a casing, a member in the casing movable from an "off" to an "on" position, said member having a key slot therein, a pair of spaced terminals in the casing each having leads therefrom to the ignition system, a second pair of spaced terminals therein each having leads to the ignition system, an ignition system electric component having spaced terminals thereon removably receivable within said key slot, said component spaced terminals engaging the first set of terminals upon insertion of the component in the key slot to place the component in circuit, and said second pair of terminals being operably connected to the movable member and closed upon movement of the member to "on" position.

References Cited by the Examiner

UNITED STATES PATENTS

279,471	6/1883	Wilson	339—183 X
727,601	5/1903	Dow	317—85 X
774,611	11/1904	Sprague	339—184 X
1,393,822	10/1921	Parker	123—146.5
1,695,518	12/1928	Watson	70—277
2,010,984	8/1935	Fitzgerald	123—146.5
2,105,304	1/1938	Wagner	200—44
2,393,616	1/1946	DeReamer	200—51.09 X
2,429,414	10/1947	Kurnstler	399—183
2,882,455	4/1959	Ferguson	70—277
3,036,297	5/1962	Simjian	340—274

LLOYD McCOLLUM, *Primary Examiner.*