Oct. 31, 1961 YOSHIO KINOSHITA 3,006,328

STARTING IGNITION BOOSTER SYSTEM

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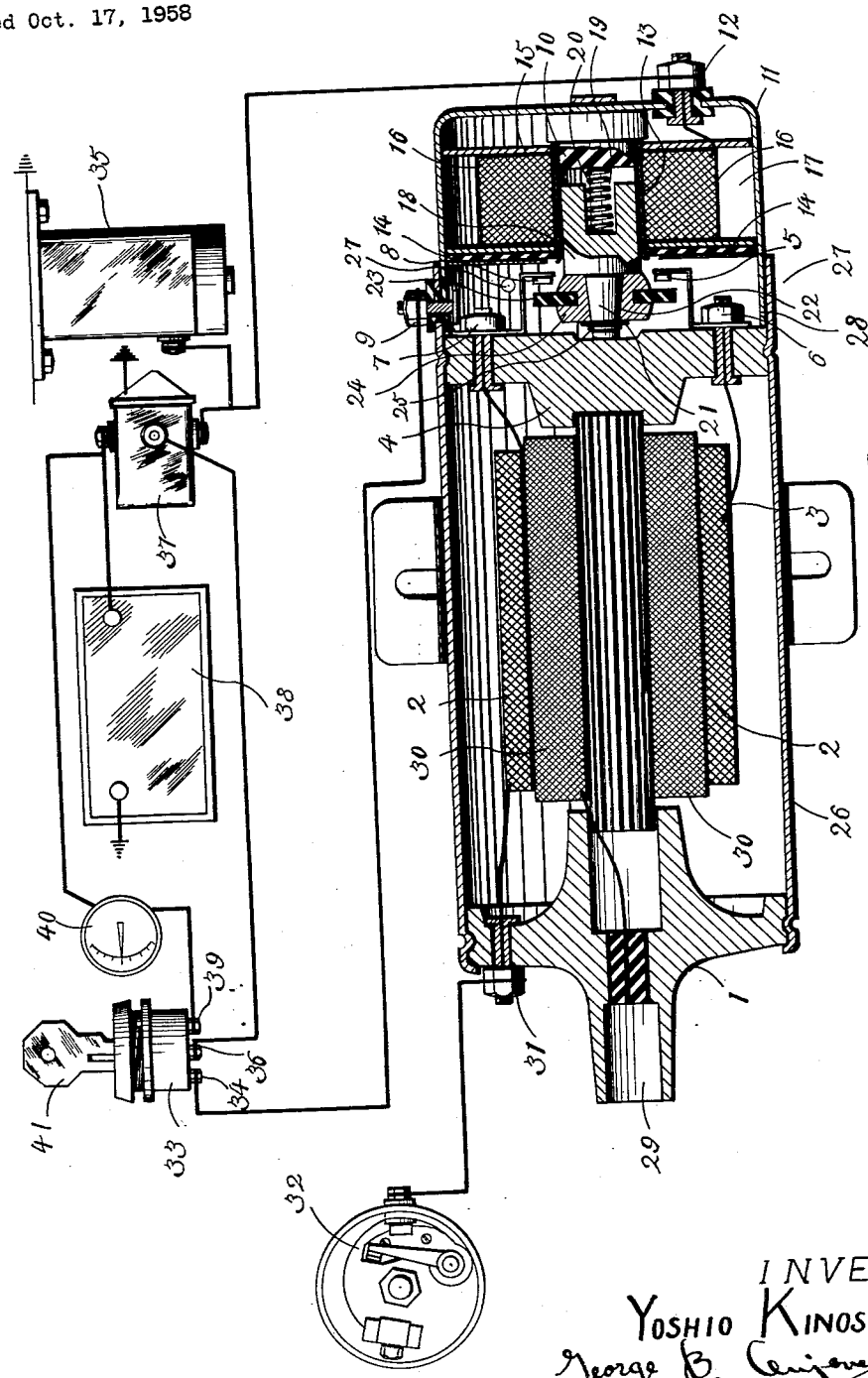


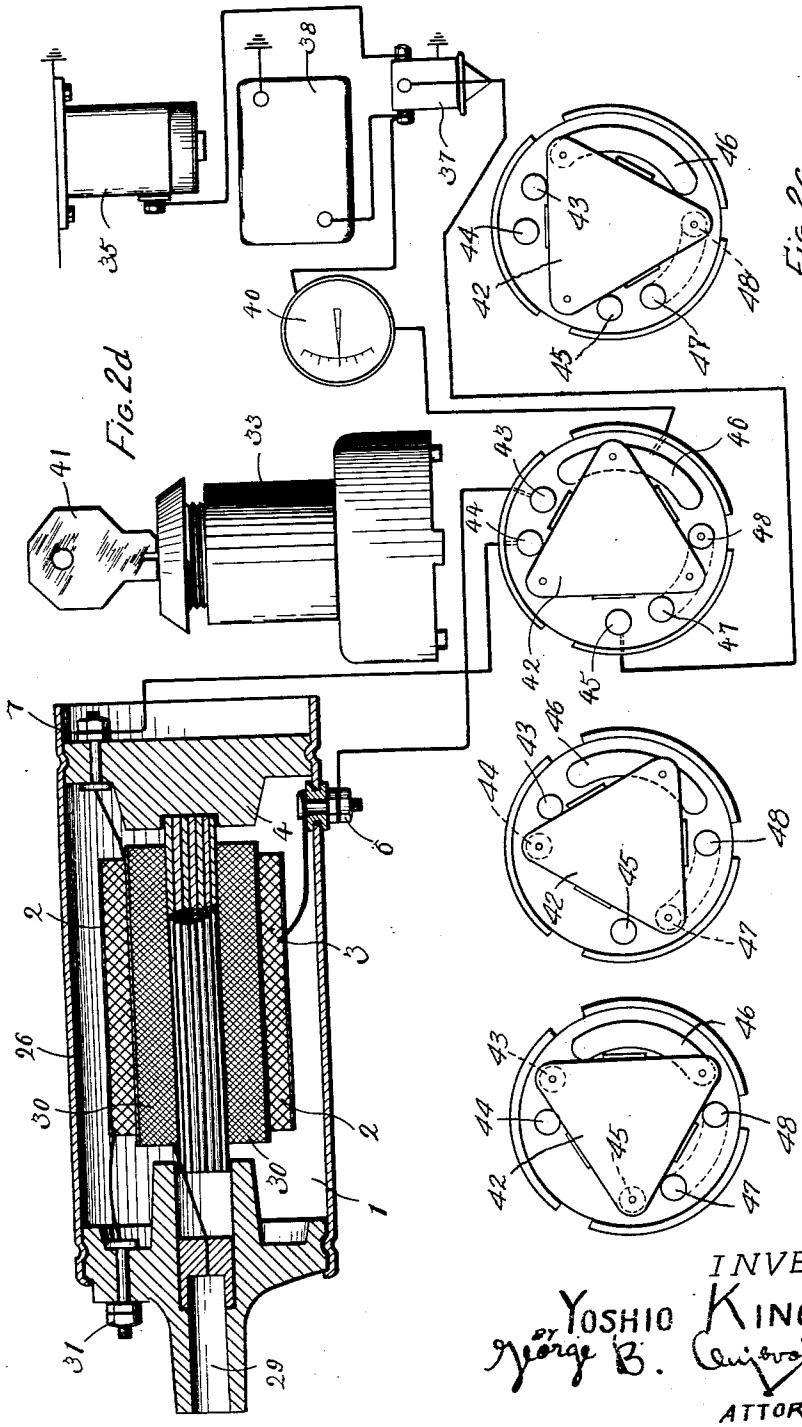
FIG. 1

INVENTOR
YOSHIO KINOSHITA
George B. Cuijpers
ATTORNEY

Oct. 31, 1961 YOSHIO KINOSHITA 3,006,328

STARTING IGNITION BOOSTER SYSTEM

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INVENTOR
YOSHIO KINOSHITA
By George B. Quigg
ATTORNEY

United States Patent Office

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STARTING IGNITION BOOSTER SYSTEM

Yoshio Kinoshita, No. 4 Kawashima-cho Nakano-ku, Tokyo, Japan

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This invention relates to a booster for the ignition starting system and more particularly to the special lay-out of the ignition coil circuit which enables the engine to start even when the battery is run down.

Heretofore, when the electric charge of an automobile battery has gone down because of wear and tear, forgetting to switch-off the ignition, low generating power of the dynamo, overuse of the radio set, heater, when a second-hand battery is used, the voltage as well as the current is often so low that it is impossible to start the engine. At such times, the engine was started in one of the following three ways: by turning the crank, by pushing the car, or by recharging the battery. Some modern cars are not equipped with a crank, and, when it is necessary to push the vehicle, since there is a hydraulic transmission, if the vehicle is not pushed at a speed of twenty miles per hour or more, it is very hard to start the engine. Moreover, in case of a second-hand car, owing to abrasion of the inner wall in the upper chamber of the cylinder, when engine oil is to ascend in said upper chamber, high voltage current induced on the secondary coil will leak out of the ignition plug. Therefore, in the existing ignition, it is very hard to overcome all these obstacles to start the engine.

An ignition booster system has now been discovered which insures the starting of the engine and eliminates the above-mentioned difficulties.

An object of the invention is to provide an ignition circuit for automobiles wherein the circuit is made to act as a low inductance on the primary coil of the ignition coil upon starting and after starting, said circuit is made to act as a high inductance on the primary coil so as to overcome the lowering of efficiency, and complete the starting of the engine.

Another object of the invention is to provide an ignition circuit for automobiles wherein a short-circuit upon starting only occurs between the primary coil input and the middle tap of said coil by means of an electro-magnetic relay fitted on the bottom of the ignition coil. After starting, said short-circuit is released so that the above-mentioned object can be effectively attained and at the same time overheating of the coil due to misconnection can also be prevented.

Other objects and advantages will become apparent from the following description of the invention.

For the purpose of illustrating the invention, there are shown in the accompanying drawings a preferred embodiment thereof, although it will be understood that the components of which the invention consists may be variously arranged and organized and that the invention is not limited to the specific arrangement and organization of the components herein shown and described.

The drawings show two embodiments of the present invention.

FIGURE 1 is a longitudinal sectional view of an ignition coil and a wiring diagram of one embodiment of the invention; and,

FIG. 2 illustrates a longitudinal sectional view similar to FIGURE 1, but of a second embodiment of the present invention showing alternate switch positions in FIGS. 2*a*, 2*b* and 2*c* and a top plan view of a switch in FIG. 2*d*.

In accordance with the first embodiment, there is shown a tap **3**, taken out of a primary coil **2** of the ignition coil **1** at the point of ⅓–⅔ turns of the number of the

windings, counting from where the input of said ignition coil is fitted on bottom of the insulator **4** and connected with the terminal **6** provided to the contact **5**. The input terminal **7** of the insulator **4** is screwed to the contact **8** and on the other hand connected with the input **9** exposed to the outside. The relay frame **11** having a metallic core **10** in center, is provided with a terminal **12**. The brass cylinder is grounded to a bobbin **15** having a brass cylinder **13** in the center and both the upper and the lower end of which are covered with insulators **14**.

An electro-magnet **17** provided with a field coil **16**, the first windings of which are connected with the brass cylinder **13**, is inserted in the metallic core inside the relay frame **11**. The last windings of the field coil **16** are connected with the terminal **12**. In center of said electro-magnet **17** is an absorbing bar **18** which is movable upward and downward and facing the metallic core **10**. The slot **19** dug on the lower side of said absorber is fitted a spring **20**, the upper side of said absorber **18** is consisted of a thin bar **21**. In the center of bar **21** is a tapered hole, where insulator **24**, having two disc-shaped contacts **23** are inserted. The insulator **24** is fastened to a thin bar **21** by means of a snap ring **25**. The relay frame **11** is attached to the lower part of the frame **26** of the ignition coil **1** by means of a screw **27**. The above is general description of the ignition coil cylinder **28**. The high voltage outlet of the secondary coil **30** is numbered **29**. The winding terminal **31** of the primary coil **2** is connected with the interrupter **32** and input **9** is connected with the engine terminal **34** of the starting and engine switch **33**. The terminal **12** together with the starter **35** is connected with the terminal of the battery **38** by the operation of the relay **37** connected with the starting terminal **36** of the starting engine switch **33**. In the drawing, the source terminal of starting engine switch **33** is numbered **39**. The ammeter is numbered **40**, and the engine key, **41**. The invention operates as follows:

First turn the engine key **41** and switch on the engine switch **33** and the current of the battery **38** flows to the source terminal **39** through the ammeter **40**, then to the engine terminal **34** and the input **9**. From the input terminal it finally flows to the interrupter **32** of a distributor through the primary coil **2** and the winding terminal **31**. At this moment, current flows from the source terminal **39** to the field coil through the starting terminal **36** and the relay **37**. In this way, as current flows from the battery **38** to the starter **35**, the engine starts turning. At this moment, as the terminal of the battery **38** is connected with the terminal **12**, current is grounded from the brass cylinder **13** through the field coil **16** and activates metallic core **10**. The latter absorbs the thin bar **21** and the discs contacts **8** and **5** respectively so that a short circuit is produced between the input terminal **7** and the tap **3**. Therefore, current flows from the input terminal **7**, the contacts **8**, **20** and **5** to the terminal **6** and the primary coil **2** through the tap **3** and finally from the winding terminal **31** to the interrupter **32**. By the action of the latter, high voltage is induced in the secondary coil **30**. Current goes to the distributor through the high voltage outlet **29**, then in order to start the ignition of the engine, to the ignition plug and the engine starts working. When the hand is released from the engine key **41**, the source terminal **39** and the starting terminal **36** being opened by the action of a spring, the current to the relay **37** is interrupted and the starter **35** stops. At this moment, the electro-magnet loses magnetism and returns to its original position by the action of the spring **20** and short-circuit between the input terminal **7** and the tap **3** will be interrupted. Hence, the car will keep running since circuit is formed by utilizing all the windings of the primary coil.

According to this invention, when the battery of 6 volt electromotive force is used and when it goes down to 4 volts, since the primary coil is still useful as low inductance at starting, it is possible to make the secondary coil produce as high voltage as when 7 to 8 volts is added to all the number of windings of the primary coil.

Therefore, even if the engine turns very slowly owing to an efficiency-lowered battery, so long as it turns, the engine will start. In the existing ignition, when the 6 volts battery is used, as long as the engine keeps turning after starting, the voltage of said battery being generated by a dynamo being regulated to between 7 and 8 volts by means of a voltage regulator, the layout of the primary coil is so made as to stand long and continuous use under 7 to 8 volts. Hence, it is natural that no efficiency whatever can be produced with an efficiency-lowered battery. According to this invention, the above-mentioned deficiencies are completely eliminated.

Another embodiment of the invention is shown in FIG. 2, and performs the same function as in FIG. 1. Although it has the defect of burning the coil if misconnected, it curtails largely the manufacturing expense. In FIG. 2, a tap **3** is taken out of the primary coil **2** of the ignition coil **1**, at the point of ⅓–⅔ turns of all the windings, counting from the side of input terminal **7** where winding starts. Said tap is connected with the terminal **6** attached to the frame **26**. The starting and engine switch **31** contains the three-point contact plate **42** and several contacts, of which **43** is connected with terminal **6**, **44** with the input terminal **7**, **45** with the relay **37**, **46** with the terminal of the battery through the ammeter, finally **47** and **48** are connected with the radio set and the fuel meter respectively. Give one turn to the engine key **41** clockwise, see FIG. 2*a*, and the three-point contact plate **42** starts turning. Current flows from the battery **38** to the tap **3** then to the primary coil **2** through the contacts **46** and 43 and finally to the interrupter through the winding terminal **31** of same primary coil. At this moment, current which shunts from the three-point contact plate **42** will actuate the relay **37** through the contact **45** so that the connection between the battery **38** and the starter **35** will be closed and the starter will turn. Thus, high voltage current induced on the secondary coil **30** flows to the ignition plug and the engine will start working. When the engine key is released by hand, the three-point rubbing plate **42** will turn backward and stop at the position shown in FIG. 2*b*. Then, flow of the current to the starter **35** will be interrupted as well as the tap **3** and current flows from the contact **44** to the input terminal **7** of the primary coil **2**, then to the primary coil so that the engine keeps turning all the time and at the same time contact **47** is engaged by plate **42** to permit a radio or the like to be energized. Turn the engine key **41** counter-clockwise and bring it to the position of FIG. 2*c* the fuel meter **48** can be energized without current flow to the coil.

It is to be observed therefore that the present invention provides for an ignition circuit which will start the car even when the efficiency of the battery goes down. The driver can still drive the car with a weak battery.

Although the present invention has been described in conjunction with preferred embodiments, it is to be understood that modifications and variations may be resorted to without departing from the spirit and scope of the invention, as those skilled in the art will readily understand. Such modifications and variations are considered to be within the purview and scope of the invention and appended claim.

What is claimed is:

In an ignition system for vehicles comprising in combination a source of potential, starter means, a relay connected between said source of potential and said starter means, an ignition coil including primary and secondary windings, said primary winding including terminal and intermediate taps, and switch means including a plurality of circularly disposed and spaced electrical contacts, said switch means including a manually rotatable, equilateral, triangular-shaped conductor plate rotatable on an axis of rotation about which said contacts are concentrically disposed, said conductor plate including three equally spaced apex portions, a first of said switch contacts connected to said source of potential and constantly engaged by one of said apex portions, a second of said switch contacts connected to said intermediate tap, a third of said switch contacts connected to said relay, said apex portions being engageable each with a respective one of said first, second and third switch contacts during a first switch position, a fourth switch contact connected to said terminal tap, said conductor plate including a second switch position in which a circuit is closed between said first and fourth switch contacts, said conductor plate including a neutral position in which said one apex portion is engaged with said first switch contact and no current flows through said conductor plate.

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