

[54] **BREAKERLESS IGNITION SYSTEMS**

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[51] **Int. Cl.**..... **F02p 3/06**

[58] **Field of Search**..... **123/148 E, 117 R, 117 A**

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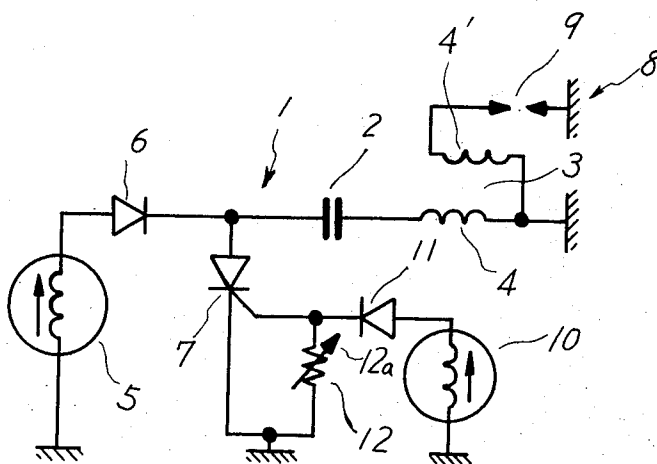
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[57]

ABSTRACT

A breakerless ignition system for use in an internal combustion engine comprising a controlled semiconductor device such as thyristor controlling a primary ignition current through an ignition coil and an ignition signal generator driven by the engine and determining the firing timing of the controlled device for the operation of the ignition system, said controlled device having a variable electrical resistor cooperative therewith to control a turn-on or firing current from said ignition signal generator through the gate and cathode of the controlled device, said variable electrical resistor having a wiper movable in cooperation with movement of an accelerator of the engine so that when the accelerator moves to provide the increased acceleration to the engine said variable electrical resistor allows the turn-on current to promptly conduct through the gate and cathode of said controlled device for the advanced ignition phase of the engine and when the accelerator of the engine moves to provide the increased deceleration to the engine said variable electrical resistor tends to reduce the turn-on current through the gate and cathode of the controlled device for the delayed ignition phase of the engine.

5 Claims, 7 Drawing Figures



SHEET 1 OF 2

FIG.1

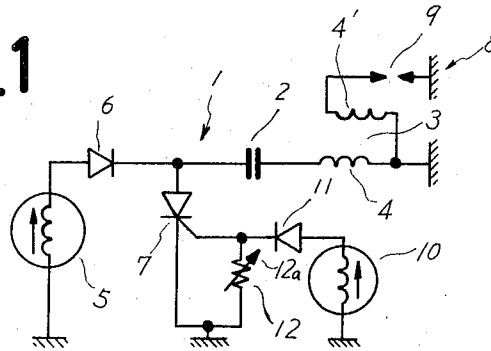


FIG.2

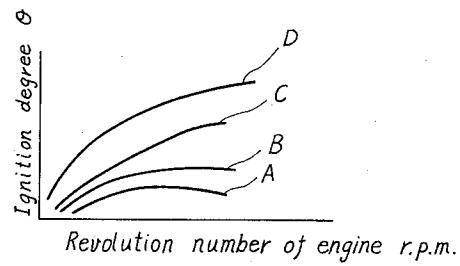


FIG.3

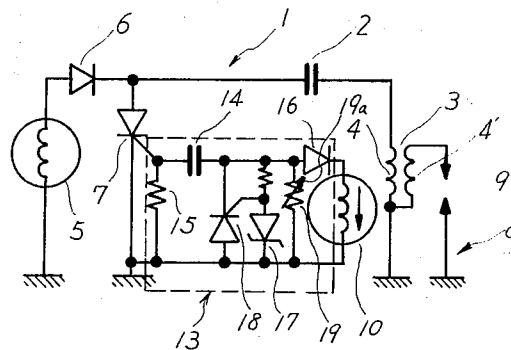


FIG.4

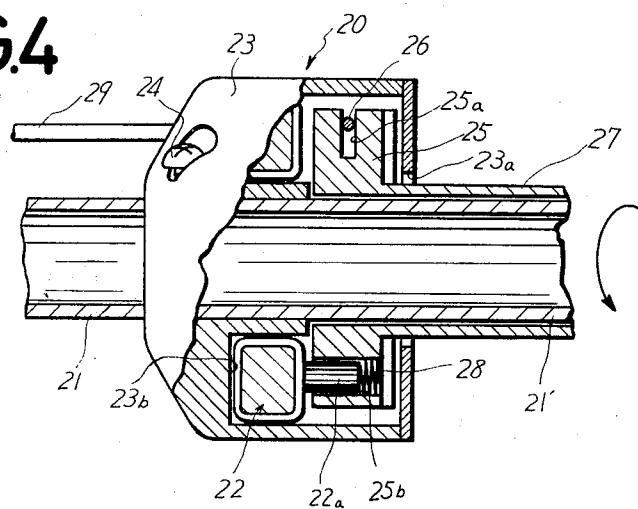


FIG.5

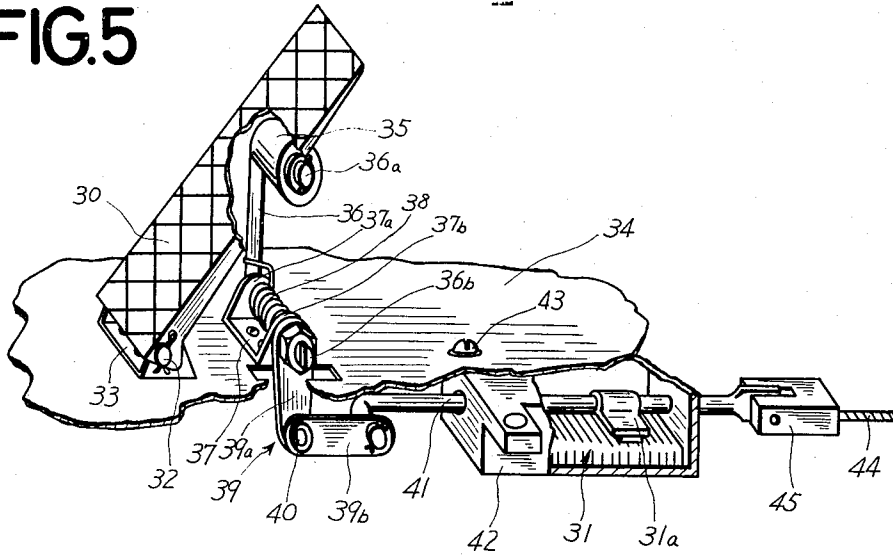


FIG.6

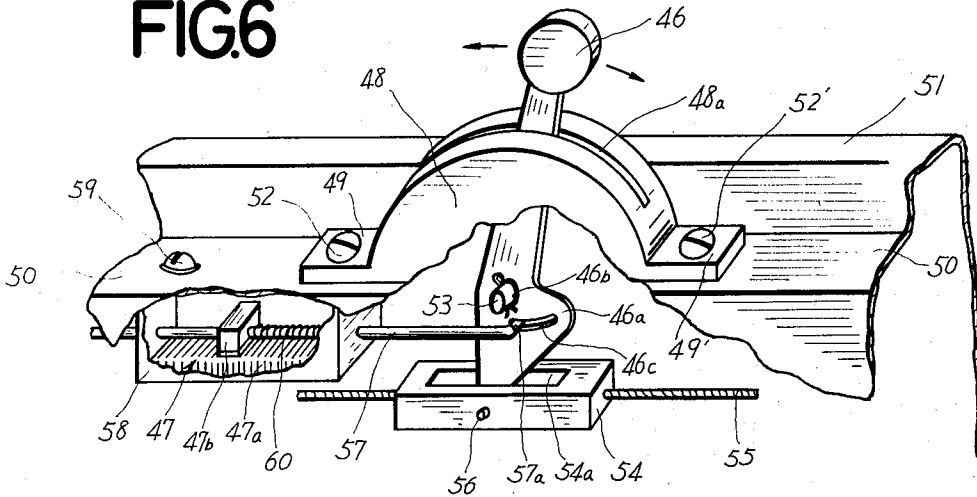
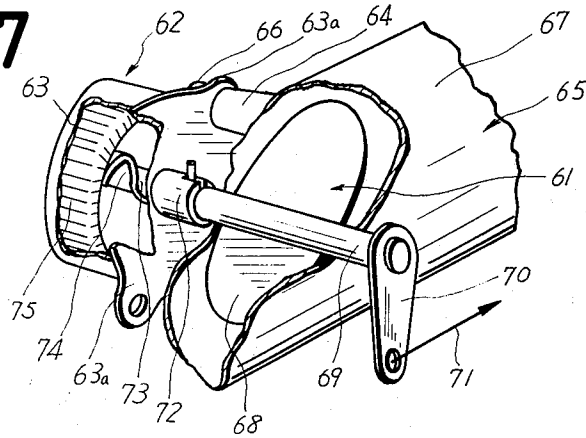


FIG.7



BREAKERLESS IGNITION SYSTEMS

FIELD OF THE INVENTION

This invention pertains to a breakerless ignition system for use in internal combustion engine and more particularly to a breakerless ignition system wherein a solid state or semi-conductor controlled device is provided which controls the conduction or interruption of primary ignition current through a primary ignition circuit in timing relation with the position of a piston in a corresponding cylinder of the engine.

BACKGROUND OF THE INVENTION

A breakerless ignition system for use in an internal combustion engine generally comprises an ignition signal generator which is operatively connected to an internal combustion engine and produces an ignition signal in timing with the position of a piston in a corresponding cylinder of the engine to control the conduction of a solid state or semi-conductor controlled device which in turn controls the conduction and interruption of a primary ignition current through a primary ignition circuit of the ignition system. Because of variable output of the ignition signal generator corresponding to variation in numbers of revolution of the engine to which the generator is connected, the controlled semi-conductor device correspondingly varies timewise in its conduction. In other words, when the engine rotates at lower numbers of revolution, turn-on or firing current conducts in lagging phase relation to the revolution of the engine, through the gate and cathode of the controlled semi-conductor device, and when the engine rotates at higher numbers of revolution, the current conducts at the more advanced phase of the revolution of the engine, through the gate and cathode of the semi-conductor device. One of the disadvantages of such automatically variable ignition phase is that the variable ignition phase fails to positively follow the rapid acceleration and deceleration of the engine. Normally, the variation in numbers of the revolution of the engine has been delayed when the acute acceleration and deceleration were effected of the engine, that is, for some time after the operation of the acute acceleration and deceleration the engine continues to rotate at the same speed as that before the operation not to vary in the ignition phase and therefore, when such operation is effected the cylinder cannot be ignited at proper ignition phase.

SUMMARY OF THE INVENTION

Accordingly, it is a principal object of the invention to provide a breakerless ignition system for use in an internal combustion engine adapted to ignite a cylinder at proper ignition phase thereof when an acute acceleration and deceleration is intended to be effected of the engine.

In accordance with the present invention, there is provided a breakerless ignition system for use in an internal combustion engine, comprising a primary ignition circuit including a primary coil element of an ignition coil, a source to supply primary ignition current to said primary coil element of said ignition coil and a controlled semi-conductor device to control the conduction of said primary ignition current through said primary coil element of said ignition coil, a secondary ignition circuit including a secondary coil element of said ignition coil and an ignition plug connected to said

secondary coil element of said ignition coil, said plug being disposed within a corresponding cylinder of the engine, and an ignition signal generator driven by the engine to produce an ignition signal in timing with the position of the piston in the cylinder, characterized by said controlled semi-conductor device having a variable electrical resistor associated therewith to control a turn-on current from said ignition signal generator through the gate and cathode of said controlled semi-conductor device, said variable electrical resistor having a wiper movable in accordance with movement of an accelerator of the engine so that the accelerator moves to provide the increased acceleration to the engine said variable electrical resistor allows turn-on current to promptly conduct through the gate and cathode of said controlled device for the advanced ignition phase of the system and when the accelerator of the engine moves to provide the increased deceleration to the engine said variable electrical resistor tends to reduce the turn-on current through those of said controlled device for the delayed ignition phase of the system.

BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing and other objects and features of the present invention will become apparent to those skilled in the art from the teaching of the following description of preferred embodiments in conjunction with the accompanying drawings;

FIG. 1 is a schematic diagram showing one embodiment of a breakerless ignition system for use in an internal combustion engine in accordance with the present invention;

FIG. 2 is a graph of advanced ignition degree plotted against the numbers of revolution of the engine into which the ignition system shown in FIG. 1 is incorporated;

FIG. 3 is a schematic diagram showing another embodiment of the breakerless ignition system in accordance with the present invention;

FIG. 4 is a fragmentary and partially sectional view of an accelerating grip of an automobile into which a slide rheostat is incorporated for the advanced ignition phase of the ignition system as shown in FIG. 1;

FIG. 5 is a fragmentary and partially broken accelerating pedal means of a motor car, in which a slide rheostat is incorporated for the advanced ignition phase of the ignition system of FIG. 1;

FIG. 6 is a perspective view illustrating an accelerating handle in a boat body comprising an outboard engine, with a slide rheostat provided therein for the advanced ignition phase of the ignition system shown in FIG. 1 and with some portions broken away for the purpose of clarification;

and FIG. 7 is a perspective view illustrating a throttle valve mechanism in a carburetor in use for a multiple-use engine and a variable electrical resistor attached thereto for the advanced ignition phase of the ignition system shown in FIG. 1.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

Referring now to FIG. 1 of the drawings, there is schematically illustrated a preferred embodiment of a breakerless ignition system for use in an internal combustion engine in accordance with the present invention and in the illustrated embodiment the ignition system may be of capacitor discharge type. A primary ig-

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niton circuit 1 of the ignition system comprises a capacitor 2, a primary coil element 4 of an ignition coil 3 with one end thereof connected to one of the ends of the capacitor 2 and with the other end of the primary coil element 4 grounded to earth and a power source 5, such as a magneto drivingly connected to the cam shaft of the engine which produces AC power in timing with the revolution of the engine and which is connected at one end thereof through a forward diode 6 to the other end of the capacitor 2 to supply the power thereto while the other end of the power source 5 is grounded to earth. The primary ignition circuit also comprises a controlled semi-conductor device 7, such as thyristor with the anode thereof connected to the said other end of the capacitor 2 and with the cathode grounded to earth.

A secondary ignition circuit 8 comprises a secondary coil element 4' of the ignition coil 3 with one end thereof connected to the grounded end of the primary coil element 4 and with the other end connected to an ignition plug 9 disposed within a corresponding cylinder of the engine.

When one positive half wave of AC power is produced on the power source 5, it flows through the diode 6 to the capacitor 2 and the primary ignition coil element 4 of the ignition coil 3 to electrically charge the capacitor 2. At that time, the controlled semi-conductor device 7 remains non-conducting or interrupted so that power from the source 5 is not directed to the controlled device 7. During production of the other negative half wave on the power source, when the controlled device 7 is in the conductive state in timing with the position of the piston in the cylinder the capacitor 2 is then discharged through the semi-conductor device 7 and the primary coil element 4 of the ignition coil 3 to induce high voltage in the secondary coil element 4' and to ignite the combined fuel and gas within the cylinder by the spark issuing from the ignition plug 9.

In order to permit the controlled semi-conductor device 7 to fire or conduct in timing relation to the position of the piston in the cylinder, there is provided an ignition signal generator 10 in the form of magnet-type generator which is drivingly connected to the cam shaft of the engine to produce an ignition signal for each upper dead point of the piston in the cylinder and which is electrically connected at one end thereof through a diode 11 to the gate of the controlled device 7 and at the other end thereof grounded to earth. When the piston in the cylinder substantially reaches the upper dead point, the ignition signal in a direction as indicated at an arrow from the generator 10 flows through the diode 11 to the gate and cathode of the controlled semi-conductor device 7 to allow it to fire or conduct. Thus, as above-mentioned the primary or discharging current from the capacitor 2 flows through the controlled semi-conductor device 7 and then through the primary coil element 4 of the ignition coil 3 to induce high voltage on the secondary ignition circuit so that the ignition of fuel and gas may be effected in the cylinder by the spark issuing from the plug.

A variable electrical resistor 12 is provided to forcibly advance or delay the ignition phase of the ignition system, which resistor is connected in parallel to the gate and cathode of the controlled device 7 to by-pass the firing or turn-on current from the ignition signal generator 10. The variable resistor 12 includes a wiper

or electrical brush 12a operatively connected to an accelerator (not shown in FIG. 1) of the engine so that when the accelerator moves to provide the increased acceleration to the engine the resistance value of the resistor 12 becomes decreased to allow larger turn-on current to conduct through the gate and cathode of the controlled semi-conductor device 7 for promotion of the conduction thereof and when the accelerator moves to provide the increased deceleration the resistance value of the resistor 12 becomes increased to by-pass larger current from the signal generator 10 and therefore reduce the turn-on current through the gate and cathode of the controlled device 7 for delayed conduction thereof. Thus, when the acute variation in the acceleration occurs the ignition of the cylinder may be effected in an advanced or delayed phase corresponding to the variation in the acceleration or deceleration, although the signal generator 10 cannot immediately produce the signal of the value corresponding to the variation in the acceleration or deceleration. The features of the connection of the wiper on the variable resistor 12 to the accelerator will be described later in more detail.

FIG. 2 shows characteristics of ignition phase wherein ignition degree varies with the numbers of revolution of the engine. Curve A of FIG. 2 shows a characteristic of ignition phase when the accelerator has the lowest acceleration so that the variable resistor has the lowest value and as the acceleration becomes gradually higher with higher value of the resistor 12, characteristic of ignition phase varies as sequentially indicated in Curves B, C, and D.

Referring now to FIG. 3, there is illustrated a modified ignition system of the present invention and this system comprises an ignition signal converter 13 including a capacitor 14 charged from the ignition signal generator 10 through a fixed resistor 15 and a diode 16, a Zener diode 17 and a controlled semi-conductor such as thyristor 18 conductive in response to the conduction of the Zener diode 17 connected through the resistor 15 and the gate and cathode of the thyristor 18, to discharge the capacitor 14 through the gate and cathode of the controlled semi-conductor device 7 and the anode and cathode of the thyristor 18. When the ignition signal generator 10 produces an output in a direction indicated by the arrow, current flows from the generator 10 through a fixed resistor 15 to the capacitor 14 and then through a diode 16 to the generator 10 to charge the capacitor 14 so that a gradually increased voltage is developed across it. As soon as the voltage across the capacitor 14 reaches the Zener voltage of the Zener diode 17 it immediately breaks down and conducts to permit the discharging current to flow from the capacitor 14 through the gate and cathode of the controlled device 7 and the Zener diode 17 to the gate and cathode of the thyristor 18 and therefore, the discharging or firing current flows from the capacitor 14 through the anode and cathode of the thyristor 18 to the gate and cathode of the controlled device 7. It will be noted that the signal converter 13 may convert the ignition signal from the generator 10 into a pulse including a pointed wave edge at higher value. A variable resistor 19 is connected in parallel with the series-connected capacitor 14 and fixed resistor 15 to control the charging current through the capacitor 14 for forcibly varied ignition phase. The variable resistor 19 includes a wiper or electrical brush 19a operatively con-

connected to the accelerator (not shown) of the engine so that when the accelerator moves to obtain the increased acceleration the value of the resistor 19 becomes increased to allow larger charging current to flow to the capacitor 14 to advance the conductive phase of the controlled device 7, that is the ignition phase of the ignition plug 9 relative to the position of the cylinder piston and when the accelerator moves to obtain the decreased acceleration, that is the increased deceleration the value of the resistor 19 becomes decreased to by-pass the charging current and therefore, reduce the charging current to delay the conductive phase of the controlled device 7, that is the ignition phase of the ignition plug 9 relative to the position of the cylinder piston. Thus, it will be noted that the ignition system of FIG. 3 provides the same characteristic as that of the system as shown in FIG. 2.

Referring now to FIG. 4, an accelerating grip 20 on a handle 21 of a motorbicycle is illustrated, which has therein a ring-like slide rheostat 22 corresponding to either of the variable resistors 12 and 19 as shown in FIGS. 1 and 3, respectively. The accelerating grip 20 comprises a grip cover 23 secured adjacent and to the end of the handle 21 by means of a screw 24 which in turn extends through the grip cover 23 and is threaded into the diametrically extending threaded hole of the handle (not shown). Within the grip cover 23 is disposed a disk-like rotor 25 which is rotatably mounted around and on the handle 21. The rotor 25 includes a groove 25a provided on the partial circumference of the rotor and a throttle wire 26 is wound in and around the groove 25a in the rotor 25 with one end of the throttle wire 26 secured to the wall of the groove at any position thereof by any suitable means and with the other end of the throttle wire 26 extending from the grip cover 23 and operatively connected to a throttle valve in a carburetor (not shown). The rotor 25 has a tubular operating member 27 integral with the rotor for rotation thereof and extending through the bore 23a and longitudinally along the handle 21 to the end thereof. The accelerating grip 20 is so arranged that when the operating member 27 is manually rotated about the handle 21 in one direction to rotatably move the rotor 25 in the same direction, the throttle wire 26 is pulled in the groove 25a to shift the throttle valve in the carburetor to the open position and that when the operating member 27 is rotated about the handle 21 in the other direction to move the rotor 25 in the same direction, the throttle wire 26 is pulled out of the groove 25a to shift the throttle valve to the closed position. The main body of the slide rheostat 22 is disposed in a facing relation to the rotor 25 with the grip cover 23 and secured to a recess wall 23b in the cover by any suitable means. The main body of the slide rheostat may be conventionally formed of a resistance wire wound on an electrically insulating ring, such as ceramic ring. The slide rheostat also comprises an electrical brush 22a formed of either carbon or metal received into a hole 25b in the rotor in parallel to the axis thereof. A coil spring 28 is located behind the brush 22a and in the hole 25b of the rotor for urging the brush to engage the resistance wire coil of the slide rheostat body under a predetermined pressure. The electrical brush 22a may be grounded through the electrical conductive rotor 25 to earth and the coil resistance wire of the rheostat body is connected at one end thereof to one end of an electrical cord 29 the other end of which is in turn con-

nected to the gate of the thyristor 7 and also to the rectifier 11 as shown in FIG. 1, for example. Thus, rotation of the operating member 27 for adjustment of the throttle valve in the carburetor causes the electrical brush 22a on the rotor 25 to slidably move on the coiled resistance wire of the rheostat body so that the resistance value of the slide rheostat 22 varies with the adjusted position of the throttle valve in the carburetor for provision of the conductive phase of the controlled device in a proper manner to the ignition system.

Referring to FIG. 5, there is illustrated an accelerating pedal 30 of a motor car, which has a linear slide rheostat 31 corresponding to either of the variable resistors 12 and 19 as shown in FIGS. 1 and 3, respectively, cooperated with the pedal 30. The pedal is pivotally mounted about a pin 32 on a bracket 33 secured to a floor 34 of the car by any suitable means, for swinging movement of the pedal about the pin 32 in a clockwise direction as viewed in FIG. 5. It will be obvious to those skilled in the art that such pedal is restrained by any conventional stop (not shown) from swinging movement in a counter-clockwise direction from its illustrated position. A roller 35 in the form of a sleeve is disposed backward of the pedal 30 for engagement therewith and rotatably mounted on a C-shaped pivotal member 36 at its horizontal upper arm portion 36a. The horizontal lower arm portion 36b of the pivotal member 36 may be pivotally mounted on a bracket 37 at a pair of upright portions 37a and 37b thereof, which is in turn secured onto the floor 34. The pivotal member 36 is urged in a counter-clockwise direction as viewed in FIG. 5 by a coil spring 38 on the lower arm portion 36b of the pivotal member with one end of the spring 38 secured to the bracket 37 and with the other end thereof secured to the member 36, so that the roller 35 engages the back face of the pedal 30 under a predetermined pressure. The pivotal member 36 is securely connected at the extended portion of the arm 36b through the upright portion 37b of the bracket 37, to a vertical arm 39a of a linkage 39 at the upper end thereof and a horizontal arm 39b of the linkage, pivoted at one end thereof about a pin 40 on the lower end of the vertical arm 39a, is pivotally connected at the other end by the pin 40 to an adjacent end of an actuating rod 41 which will be in turn described just hereinbelow. The slide rheostat 31 may comprise a housing box 42 secured at the upper portion thereof to the lower face of the floor 34 by means of a bolt 43 extending through the floor 34 and threaded into the upper portion of the box. The actuating rod 41 slidably extends through the upright walls of the box 42 and is connected at the other end thereof to a throttling wire 44 by means of a connector or joint 45. The slide rheostat 31 also comprises an electrical brush 31a securely mounted on the actuating rod 41 in the housing box 42 and engaging the main body of the slide rheostat 31 within the box. The electrical brush 31a may be grounded through the electrically conducting rod 41 to earth and the coiled resistance wire of the rheostat body is connected at either end thereof to the gate of the thyristor 7 and also to the diode 11 as shown in FIG. 1, for example. In the illustrated embodiment, depression of the accelerating pedal 30 causes the electrical brush 31a of the slide rheostat 31 to be shifted with the varied position of the throttle valve to vary in the resistance value of the rheostat for variation of the conduc-

tive phase of the controlled device 7 as shown in FIG. 1.

Referring now to FIG. 6, there is illustrated an accelerating handle 46 of an outboard engine, which has also a linear slide rheostat 47 corresponding to either of the variable resistors 12 and 19 as shown in FIGS. 1 and 3, respectively, cooperated with the accelerating handle 46. In the illustrated embodiment, the handle 46 extends through a guiding slot 48a in a semi-circular handle cover 48 which is provided at both end thereof with flanges 49 and 49' secured onto a floor 50 of a boat body 51 by means of respective bolts 52 and 52' extending through the respective flanges and threaded into the floor. The accelerating handle 46 may be provided at the lower portion thereof with a substantially triangular portion 46a integral with the body of the handle, through the hole 46b of which loosely extends a pin 53 securedly mounted onto the boat body 51, so that the accelerating handle 46 is made by an operator to swingingly move about the pin 53 in either of a clockwise and a counter-clockwise directions as viewed in FIG. 6. The triangular portion 46a of the accelerating handle 46 is received at the lower edge thereof in a recess 54a of a joint 54 to which is connected a throttle wire 55 which is in turn connected to a throttle valve (not shown) in a carburetor. A pin 56 extends through the wall of the joint 55 and serves to mount the handle 46 at the lowermost portion thereof on the joint so that the handle is connected to the wire 55 for shifting of the throttle valve. The accelerating handle 46 is also provided in the triangular portion 46a thereof with a slot 46c partially arcuately extending therethrough and through the arcuate slot 46c slidably extends an operating rod 57 at the bended end thereof, the other end of which in turn extends through the box 58 of the slide rheostat 47 for adjustment thereof. The rheostat box 58 may be attached at the top thereof to the back face of the floor 50 by a screw 59 extending through the floor and threaded into the top wall of the box 58. As described in conjunction with the slide rheostat 31 as shown in FIG. 5, the main body 47a of the slide rheostat 47 is received in the box 58, with an electrical brush 47b of the rheostat, which may be of either carbon or metal, engaging the main body 47a and attached to the operating rod 57 in the box by any suitable means. A coil spring 60 may be disposed around the operating rod 57 between one of the inner wall surfaces of the box 58 and one of the surfaces of the brush 47b and thereby normally urges the operating rod 57 to be pulled in a leftwise direction as viewed in FIG. 6 until the bended end of the rod 57 engages the lefthand edge of the slot wall. The electrical brush 47b is grounded through the electrical conductive rod 57 to earth and the coiled resistance wire of the rheostat body 47a is connected at one end thereof to the gate of the thyristor 7 and also to the rectifier 11, as shown in FIG. 1, for example. In the illustrated embodiment, swinging movement of the accelerating handle 46 in a forward or counter-clockwise direction as viewed in FIG. 6, causes the electrical brush 47b of the slide rheostat 47 to shift rightwardly with the varied position of the throttle valve to provide the variation in the resistance value of the rheostat for variation in the conductive phase of the controlled device 7 as shown in FIG. 1. It will be noted that during swinging movement of the accelerating handle 46 in a backward or clockwise direction as viewed from FIG. 6 the arcuate slot 46c in the

accelerating handle 46 allows the bended end 57a of the operating rod 57 to move relative to the handle to disengage the rod with the handle, with result in that the slide rheostat 47 remains unchanged in its resistance value so that the automatically advanced ignition phase of the system may not be effected.

FIG. 7 illustrates a throttle valve mechanism 61 in use for an outboard engine and in cooperation with a variable resistor 62 corresponding to either of the variable resistors 12 and 19 as shown in FIGS. 1 and 3, respectively. The variable resistor 62 comprises a casing 63 to receive resistor components therein, with the flange portions 63a thereof mounted on a pair of posts 64 (only one of which is shown in FIG. 7) extending from one of the sides of a carburetor 65 and at the threaded end thereof through the flange portions 63a of the casing, and with the flange portions 63a also secured to the posts 64 by nuts 66 threaded onto the threaded ends of the posts. The carburetor 65 includes fuel flowing conduit 67 in which is disposed throttle valve element 68 with an actuating shaft 69 secured thereto for movement of the element to an open position and to a closed position and extending through the opposing walls of the conduit for rotation of the shaft 69. The actuating shaft 69 has one end connected to a lever arm 70 which is in turn connected to a throttle wire 71 by any suitable means and has the other end connected through a conventional joint 72 to a rotating shaft 73 extending through the casing wall and forming a part of rotor-type electrical brush 74 of the variable resistor 62 which in turn engages a cylindrical resistance element 75 of the variable resistor 62. The brush 74 may be grounded through the electrically conductive shafts 69 and 73 to earth and the coiled resistance wire of the resistance element 75 is connected at one end thereof to the gate of the thyristor 7 and also to the diode 11, as shown in FIG. 1, for example. Thus, pulling motion of the throttle wire 71 in the direction indicated at an arrow in FIG. 7 or in the reverse direction, causes the electrical brush 74 of the variable resistor 62 to rotatably shift with displacement of the throttle valve for the varied acceleration to provide the variation in the resistance value of the resistor for variation in the conductive phase of the controlled semi-conductor device 7 as shown in FIG. 1.

It will be understood that the slide rheostats as shown in FIGS. 4 to 7 may be incorporated into the ignition system as illustrated in FIG. 3 in the manner where either of them may be employed as the variable resistance 19.

While some preferred embodiments of the present invention have been described in conjunction with the drawings, it will be apparent to those skilled in the art that variations and modifications will be made in the arrangement and construction of the ignition system, which falls within the spirit and scope of the present invention. For example, the present invention may be applicable to the breakerless ignition system for use in a multi-cylinder engine. Furthermore, it will be intended that it has not been limited only to a capacitor discharge type ignition system and that it will be applicable to a primary ignition current interrupting type ignition system or to any other breakerless ignition system. Therefore, it should be noted that the present invention is intended to be limited to the definition of the appended claims.

What is claimed is:

1. A breakerless ignition system for use in an internal combustion engine and having advanced and delayed ignition phases, comprising:

- a. a primary ignition circuit including a primary coil element of an ignition coil, a source to supply primary ignition current to said primary coil element of said ignition coil and a first controlled semiconductor device to control the conduction of said primary ignition current to said primary coil element of said ignition coil;
- b. a secondary ignition circuit including a secondary coil element of said ignition coil and an ignition plug connected to said secondary coil element of said ignition coil, said plug being disposed within a cylinder of said engine;
- c. an ignition signal generator driven by said engine to produce an ignition signal in timing with the position of a piston in said cylinder; and
- d. an ignition signal convertor connected between said ignition signal generator and said first controlled semiconductor device, said ignition signal convertor comprising a capacitor charged by said ignition signal generator, a Zener diode rendered conductive in response to predetermined voltage across said capacitor, a second controlled semiconductor device rendered conductive upon conduction by said Zener diode, said capacitor thereupon discharging through the gate and cathode of said second controlled semiconductor and through the anode and cathode of said first controlled semiconductor and a variable electrical resistor connected to said capacitor to control charging of said capacitor by said ignition signal generator, said variable electrical resistor having a wiper movable in accordance with movement of the accelerator of said engine

so that when said accelerator moves to provide increased acceleration of said engine, said variable electrical resistor effects increased charging of said capacitor for the advanced ignition phase of said system and so that when the accelerator of said engine moves to provide increased deceleration of said engine, said variable electrical resistor reduces the charging of said capacitor for the delayed ignition phase of said system.

2. The breakerless ignition system as set forth in claim 1, wherein said variable electrical resistor is disposed in the cover of an autobicycle accelerating grip, said wiper of said resistor being movable in accordance with movement of the rotor of said accelerating grip.

3. The breakerless ignition system as set forth in claim 1, wherein said variable electrical resistor is disposed adjacent an accelerating pedal, said wiper of said resistor being movable in accordance with movement of said accelerating pedal.

4. The breakerless ignition system as set forth in claim 1, wherein said variable electrical resistor is disposed adjacent an accelerating handle of an outboard engine, said wiper of said resistor being movable in accordance with forward accelerating movement of said handle.

5. The breakerless ignition system as set forth in claim 1, wherein said variable electrical resistor is disposed adjacent a carburetor, said wiper of said resistor being movable in accordance with movement of an actuating rod of a throttle valve in said carburetor.

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