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REMOTE CONTROL MEANS FOR INTERNAL COMBUSTION ENGINES

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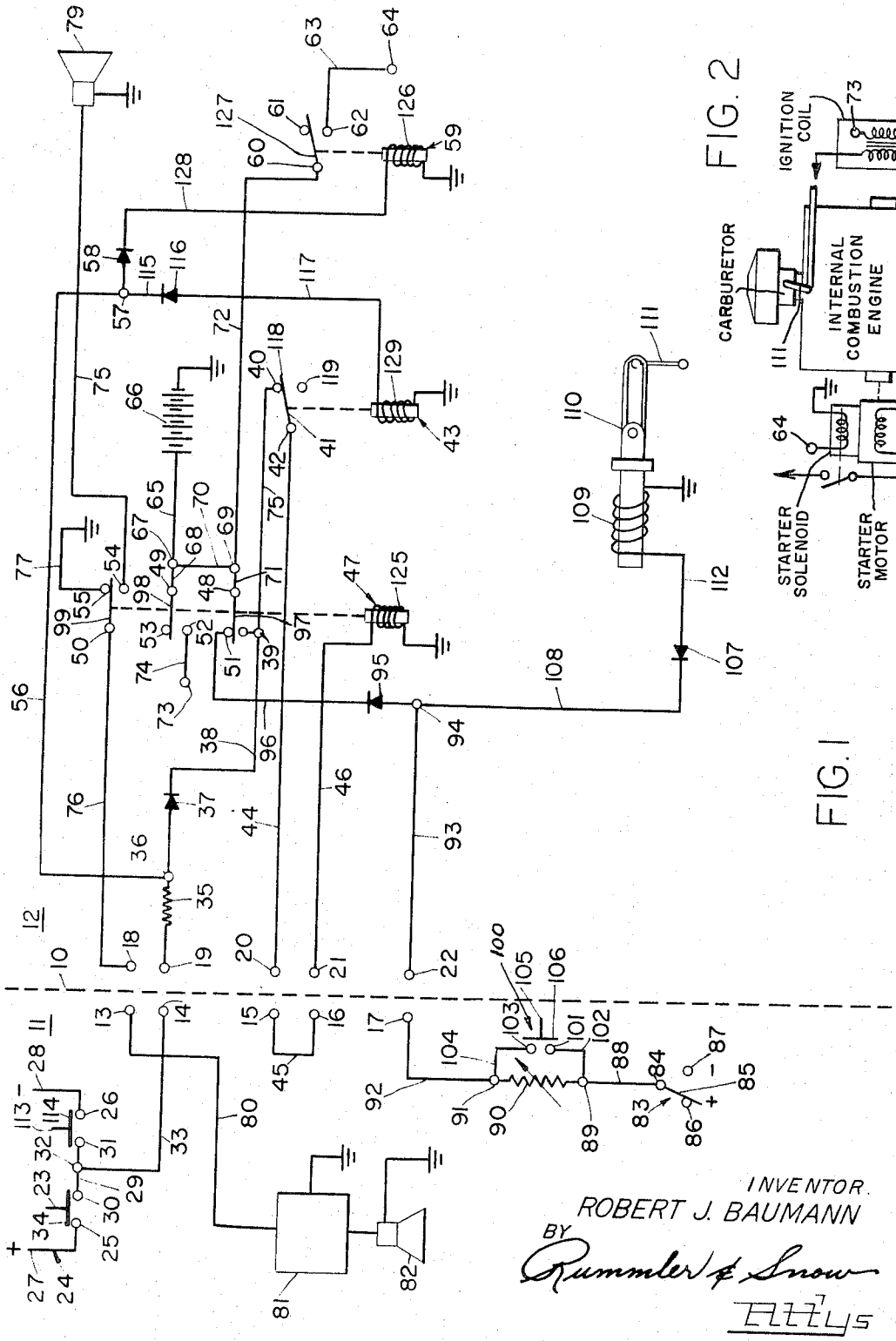


FIG. 2

FIG. 1

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REMOTE CONTROL MEANS FOR INTERNAL COMBUSTION ENGINES

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ABSTRACT OF THE DISCLOSURE

Electrical means, operation of which is controlled from a remote station, employ a voltage to crank said engine and close a switch to couple the ignition coil of said engine to its battery for self operation of the engine after removal of said voltage. By reversing current through control at said remote station either said switch may be opened to uncouple the ignition coil and battery and thereby turn off said engine or selectively its carburetor may be controlled for adjusting engine idle, or said battery may be charged.

This invention relates to remote control means for internal combustion engines. Particularly the invention relates to control apparatus for starting and stopping internal combustion engines and the like from remote locations.

Normally an internal combustion engine, such as that which is used in automotive vehicles, requires an initial warming up period before the engine will operate at its optimum. Accordingly, it is advisable to start an engine and allow it to idle for a short period before use to allow the engine to attain its operating temperature. It is especially important to satisfy the requirement if an engine has been exposed in cold weather for an appreciable period of time because failing to provide the warm-up period results in engine malfunction, frequently accompanied by choking and flooding with thereto attendant difficulties.

Without a remote control mechanism for starting a vehicle engine, an operator generally suffers the inconvenience of sitting in his automobile while his engine passes through the initial warming up period. The inconvenience is aggravated in cold weather if there is no heated garage, because the interior of the vehicle remains cold until it is warmed by the vehicle heater, which remains cold until after the engine is warmed.

It is accordingly desirable to be able to start a vehicle engine prior to entering the vehicle by controlling the starting operation from a position remote from a vehicle, for example, from within the residence of the vehicle operator. Thus, a vehicle engine might be started and warmed up before the operator actually enters the vehicle, and in cold weather the interior of the vehicle could be warmed before entry of its operator.

Several prior art mechanisms have been proposed for remote control of the starting of an internal combustion engine of the class ordinarily found in automobiles. While each of the prior remote control means performs satisfactorily within the limitations of its construction, none of the remote control means in the prior devices is entirely complete and therefore, to the extent of their inadequacies, each requires improvement.

In accordance with the instant invention and as an object thereof, an improved remote control means for internal combustion engines is provided.

A further object of the instant invention is the provision of control means for stopping as well as starting an engine from a remote position.

An additional object of the instant invention is the provision of a remote control means of the class described,

characterized by a monitoring mechanism, whereby a signal is emitted advising of the condition or tone of the engine remotely controlled.

Another object of the instant invention is the provision in a remote control mechanism of the class described of automatic battery charging means.

A yet further object of the instant invention is the provision in a remote control mechanism for internal combustion engines of a remote rapid accelerator means for rapidly increasing engine speed as desired.

The foregoing and other objects, features and advantages of the present invention will become more apparent upon consideration of the following description and appended claims, when considered in conjunction with the accompanying drawings wherein the same reference character or numeral refers to like or corresponding parts throughout the several views.

On the drawings:

FIG. 1 is a schematic circuit diagram of one embodiment of the present invention.

FIG. 2 is an illustration in generally symbolic form of an internal combustion engine and engine starting means for which the circuit of FIG. 1 is adapted.

Referring now more particularly to the drawing, there is shown a connector or cable **10** which may extend between a remote control station **11** and the approximate storage area **12** for an internal combustion engine vehicle to be controlled. An electrical fixture such as a plug or its equivalent disposed at station **12** and having a plurality of terminals **13**, **14**, **15**, **16** and **17** is connectable through said connector or cable **10** to an electrical fixture such as a socket or the like which may be disposed adjacent the internal combustion engine to be remotely controlled and supporting terminals **18**, **19**, **20**, **21** and **22** which are connectable to the terminals **13**, **14**, **15**, **16** and **17**, respectively, through said cable. The complete remote control means herein may be considered as comprising essentially five co-acting circuits, as follows: (A) Engine Starting Circuits; (B) Engine Monitoring Circuit; (C) Battery Charging Circuits; (D) Engine Speed Control Circuit, and (E) Engine Stopping Circuit. The foregoing circuits will be separately considered in the ensuing description to facilitate what is believed to be a ready understanding of the invention.

A.—*Engine starting circuit*

This circuit comprises a push start button **23** which is normally spring biased to an open position. The start button **23** is a component in a start-stop switch mechanism generally designated as **24** and having a positive terminal **25** and a negative terminal **26** connected to corresponding terminals of power or voltage source (not shown) by circuit wires **27** and **28**, respectively. Circuit wire **29** has a pair of opposite end terminals **30** and **31** which are disposed in operative relationship with and opposite terminals **25** and **26**, respectively, as illustrated in the drawing. Medial of the circuit wire **29** is a terminal **32** which is connected to the terminal **14** by means of a circuit wire **33**. The start button **23** comprises a conductive plate **34** which is disposed adjacent terminals **25** and **30** though normally out of contact therewith. However, terminals **25** and **30** are engaged by said plate **34** upon depression of the start button **23** against the action of its biasing spring (not shown).

While the start button **23** is held depressed, current will flow from the positive pole of the source through the terminal **14** through cable **10** to the terminal **19**. The terminal **19** is connected to one side of a resistance **35** the other side of which is connected to a terminal or post **36**. The terminal or post **36** connects to one side of a diode or rectifier **37** which conducts from the positive source away from terminal **36**. The other side of rectifier

37 is connected by circuit wire 38 to a relay switch contact 39. The contact 39 is connected to another relay switch contact 40 by circuit wire 75. By means of a switch arm 41 which is normally biased against contact 40, the contact 40 is connected to pole 42 of a relay 43 presently to be described. The pole 42 by means of a circuit wire 44 is connected to terminal 20 which is connected to terminal 21 through a wire 45 which at its opposite ends connects to terminals 15 and 16, as illustrated. Terminal 21 by means of circuit wire 46 connects to one side of the electromagnetic coil 125 of a triple pole relay 47, the opposite side of said coil 125 being connected to ground.

The poles of relay 47 are identified as 48, 49 and 50, and each thereof is a double throw or has a pair of contacts against which its respective switch arm is normally spring biased in the position illustrated in the drawing.

The contacts of or associated with pole 48 are the previously identified contact 39 and a contact 51. They connect to their pole by switch arm 97. Those contacts associated with the pole 49 are identified by the numerals 52 and 53 and they are put into circuit by switch arm 98. Those contacts associated with the pole 50 are identified by the numerals 54 and 55 and they connect into circuit by switch arm 99. Immediately that relay 47 is energized, its three switch arms 97, 98 and 99 are drawn against the actions of their respective biasing springs from their normal positions, herein being the positions shown in the drawing, into engagement with contacts 39, 52 and 54, respectively.

A circuit wire 56 connects the terminal 36 to a terminal 57. One side of a diode or rectifier 58 is connected to and conducts from the positive source away from said terminal 57. The opposite side of said rectifier 58 is connected by circuit wire 128 to one side of the electromagnetic coil 126 of a single pole relay 59, the other side of said coil 126 being connected to ground, as illustrated. The pole 60 of relay 59 has two throws or contacts 61 and 62 which are placed in circuit by a switch arm 127 which is normally spring biased to contact 61, as illustrated. A circuit wire 63 connects switch contact 62 to one terminal 64 of the starter solenoid of the internal combustion engine to be controlled. When the relay 59 is energized, its switch is drawn against contact 62 to energize said starter solenoid.

A circuit wire 65 connects the positive terminal of the battery 66 of the internal combustion engine to be started to a terminal 67, the negative terminal of battery 66 being grounded as shown. Terminal 67 is connected to relay pole 49 by a circuit wire 68. Terminal 67 is also connected to a terminal 69 by circuit wire 70. Terminal 69 is connected to relay pole 48 by a circuit wire 71. Additionally, the terminal 69 is connected to relay pole 60 by a circuit wire 72.

Once the relay 47 is energized, contact 52 will be communicatively connected to the battery 66 through the switch arm 98, the associated pole 49 of which is connected to said battery through the wires 68 and 65 as aforesaid. Inasmuch as the contact 52 is connected to terminal 73 of the ignition coil of the internal combustion engine being remotely controlled by a circuit wire 74, said ignition coil will be energized directly by the battery 66. The starter solenoid will also be energized by the battery 66, provided switch arm 127 is against contact 62, because of the flow of electricity through a continuous path provided by the circuit wires 65, 70 and 72 to the pole 60, thence through the switch 127.

To energize said starter solenoid, it is required that start button 23 be depressed to connect relay 59 to the positive source through terminal 36, circuit wire 56, rectifier 58 and circuit wire 128. However, when start button 23 is released, relay 59 will open and switch arm 127 will return to contact 61 whereat current from battery 66 will have no effect. From the foregoing, it is apparent that once the engine of the vehicle has started, start button 23 may be released.

When start button 23 is pushed, the relay 47 will also be energized, the same by reason of flow of current from the positive source through rectifier 37, circuit wire 38, contact 39, circuit wire 75, contact 40, switch arm 41, circuit wires 44 and 45 and through circuit wire 46. However, when the start button 23 is released, the relay 47 will continue to be energized but now from battery 66. That automatic phenomenon results from flow through circuit wires 65, 68 and 71, then through pole 48, switch 97 and contact 39, then through circuit wire 75 through switch 41 then through the circuit wires 44, 45 and 46, and back to the relay 47 which in turn closes contact 39 to the battery. Simultaneously, switch 98 will be closed to contact 52, and said ignition coil will be continuously energized by the battery notwithstanding release of starter button 23.

To deenergize the automatically energized relay 47, another of the coacting circuits has been provided and will be described presently.

B.—*Monitoring circuit*

This circuit comprises a circuit wire 76 which connects the terminal 18 with the relay pole 50. Until the relay 47 is energized, as aforesaid, the pole 50 is connected to the contact 55 by switch arm 99. The terminal 55 is merely grounded through wire 77. Upon actuation of the relay 47 through start button 23, the switch 99 is pulled to the contact 54. Contact 54 is connected by circuit wire 75 to one terminal of a grounded sound-actuated electrical wave transmitter mechanism 79 which is mounted in sound receiving alignment with said internal combustion engine. Transmitter mechanism 79 may be of conventional construction, and is adapted to receive engine sound vibrations and convert same into electrical energy for transmission.

By means of circuit wire 80, terminal 13 is connected to one side of a grounded amplifier 81 which is connected in operative relationship with a grounded speaker 82 suitably mounted at remote station 11. Accordingly, when the relay 47 has been energized, a circuit is established between transmitter mechanism 79 to the speaker 82 through the circuit wires 75, 76 and 80. Additionally, attention is invited to the fact that even after the start button 23 has been released, the transmitter 79 will continue to emit signals corresponding to the sound picked up, by reason of continuity of the circuit to speaker 82 through the contact 54 which is connected to pole 50 by reason of energization of the relay 47 through the battery 66, as aforesaid. Furthermore, when the starter circuit is deenergized, that is to say, when the relay 47 is deenergized, the signal energy emitted by the transmitter mechanism 79 will not be connected to speaker 82 as the switch 99 will be open, that is, in the position shown in the drawing.

C.—*Battery charging circuit*

This circuit may comprise a single pole double throw switch 83 having a pole 84, a switch arm 85, a contact 86 connected to the positive side of a power or voltage source and a contact 87 connected to the negative side of a power source, as indicated in the drawing. The pole 84 is connected by a circuit wire 88 to a terminal 89. One side of a rheostat or variable resistance 90 is connected to the terminal 89, and the other side of said rheostat or variable resistance 90 is connected to a terminal 91. A circuit wire 92 connects the terminal 91 and the terminal 17 which in operative position is communicatively connected through cable 10 to the terminal 22, as previously indicated.

By means of a circuit wire 93, the terminal 22 is connected to a terminal 94. One side of a diode or rectifier 95 is connected to the terminal 94, and the other side of said diode 95 is connected to the contact 51 by a circuit wire 96. The disposition of the diode 95 is such that

it will conduct from a higher to a lower potential or from a positive voltage source away from the terminal **94** toward the contact **51**. Accordingly, when the switch arm **85** engages contact **86**, current will be conducted through the rheostat **90** through the circuit wire **92** through the cable **10**, thence through the circuit wire **93** through the rectifier **95** through the circuit wire **96** to the contact **51** across switch arm **97** through pole **48** through the circuit wire **71** to the terminal **69**, thence through the circuit wire **70** to the terminal **67**, and from there to the positive side of the battery **66** through the circuit wire **65** to thereby charge said battery.

It is appreciated that this battery charging circuit is established only when the relay **47** is deenergized. That is to say, should the relay **47** be energized, switch arm **97** would be drawn from its position in contact with terminal **51** into engagement with terminal **39**, whereby there would be an open circuit at contact **51**, and the battery could not be charged. Additionally, attention is invited to the fact that the switch arm **127** is in normally spring-biased position against contact **61**, unless intentionally actuated in the manner herteofore described. Accordingly, the path from the terminal **69** to the contact **61** results in an open circuit at contact **61**. Therefore, the single path open for current flow when the switch arm **85** is in the battery charge position is from the terminal **69** to the positive side of the battery **66**, as aforesaid. The charging rate is determined by the rheostat **90**.

D.—*Engine speed control circuit*

This circuit is operated from switch **83**. However, to be effective, the switch arm **85** must engage the negative terminal **87**; that is to say, the switch **85** must be moved from the position illustrated in the drawing to the alternate position. This engine speed control circuit includes a rheostat bypass switch generally designated by the numeral **100**, and one contact **101** of which is connected to the terminal **89** by a circuit wire **102**. The other contact **103** of said bypass switch **100** is connected to terminal **91** by means of a circuit wire **104**. The bypass switch **100** is normally open, its contacts **101** and **103** being closable by a normally outwardly biased push button **105** having a contact closing plate **106** which when engaged with contacts **101** and **103** completes a circuit from the switch **83** to the terminal **94** through circuit wires **88**, **92** and **93**.

The terminal **94** is connected to one side of a diode or rectifier **107** by means of a circuit wire **108**. The other side of rectifier **107** is connected by circuit wire **112** to one side of the coil **109** of a plunger solenoid **110**, the other side of said coil **109** being grounded, as illustrated. The plunger of said solenoid **110** is mechanically connected to a carburetor means including a carburetor and its pivoted carburetor stud or lever **111**. Through selective positioning of the latter, volume of flow of gas to said internal combustion engine can be remotely controlled to regulate the engine speed in a conventional fashion.

The diode **107** is disposed to conduct from a negative to a positive potential. That is to say, it will conduct current from the negative voltage source away from terminal **94**. Accordingly, therefore, when current reaches the terminal **94** with the switch arm **85** disposed against the contact **87**, the current will flow through the rectifier **107** to actuate the solenoid **110**. It is appreciated that such current does not have a path through the rectifier **95**, as said rectifier **95** acts as an effective barrier to the passage of current from the negative terminal **87** away from terminal **94**.

It is also appreciated that the normal course of the engine speed control current is from the terminal **87** through the rheostat **90** through the circuit wires **92**, **93**, **108** and **112** to energize the solenoid to actuate the carburetor lever **111**. Furthermore, such normal course allows adjustment of engine speed by varying the rheostat to cause a variation in potential on solenoid **110** and, accordingly, variation of the force of pull on the solenoid plunger and consequently on the lever **111**. However, if a rapid increase in engine speed is desired, the push button **105** may be pressed against its normal spring biasing to engage plate **106** with the contacts **101** and **103**, with a resultant rapid accelerating action of the plunger of solenoid **110**, as the voltage will be at substantially source potential.

E.—*Engine stopping circuit*

This circuit comprises a stop button **113**, having a switch plate **114** adapted to engage contacts **31** and **26** when depressed. Switch plate **114** is normally spring biased out of engagement with said contacts **31** and **26**. When the plate **114** engages contacts **31** and **36**, current flows through the circuit wire **28** from the negative source to the terminal **32** through the circuit wire **33**, thence through cable **10** through the resistor **35** and to the terminal **36**. Inasmuch as rectifier **37** will only conduct from a positive source away from terminal **36**, said rectifier **37** is an effective barrier to current from a negative source at terminal **36**. Accordingly, the only path available to such current from the negative source is through the wire **56** to the terminal **57**. The terminal **57** is connected by a circuit wire **115** to one terminal of a diode or rectifier **116**, the opposite terminal of which is connected to one side of the electromagnetic coil **129** of the relay **43** by means of a circuit wire **117**, the opposite side of said coil **129** being grounded, as illustrated. The rectifier **116** is disposed so as to conduct current from a negative source away from terminal **57**. The relay **43** comprises the single pole **42**, heretofore identified, and a pair of contacts, one being **40**, heretofore identified, and the other being **119**. Switch arm **41**, heretofore defined, connnects said contacts **40** and **119** into circuit.

When the relay **43** is energized, the switch arm **41** is drawn against the contact **119** to open the circuit between the circuit wires **75** and **44** which are in normal communicative connection because the switch arm **41** is biased toward the contact or terminal **40**, being the position illustrated in the drawing. Immediately the circuit between the wires **75** and **44** is broken, the relay **47** becomes deenergized and the switch arms **97**, **98** and **99**, actuated by said relay, assume the position shown in the drawing. Accordingly, the battery **66** becames disconnected from its operative connection with the ignition coil and the relay coil **125**, as a consequence of which the ignition coil as well as relay **47** become de-energized, and the engine of the controlled vehicle will stop. To subsequently energize the relay **47**, it requires pushing of the button **23** into contact with the terminals **25** and **39** to restart the cycle herein described.

As many substitutions or changes could be made in the above described construction, and as many apparently widely different embodiments of the invention within the scope of the claims could be constructed without departing from the scope and spirit thereof, it is intended that all matter contained in the accompanying specification shall be interpreted as being illustrative and not in a limiting sense.

What is claimed is:

1. In apparatus for remotely controlling the starting of an internal combustion engine and having a battery, electrically operable engine starting means including a starter solenoid and an ignition coil remotely manually controlled circuit means for simultaneously connecting a voltage source to said starter solenoid and said ignition coil to said battery and for maintaining said battery and said ignition coil in coupled condition to start and thereafter continue to run said engine after starting, and a carburetor for supply of fuel to said engine, the improvement comprising adjustable means for controlling current flow from a voltage source for regulating fuel flow from said carburetor to said engine and accordingly the speed of said engine once started.

2. The combination of claim **1** further characterized by a circuit mechanism for selectively coupling said bat-

tery and said carburetor to one side of said voltage and said circuit means to an opposite side of said voltage source for selectively charging said battery or controlling fuel flow to said engine when said circuit means is deenergized.

3. In apparatus for remotely controlling the starting of an internal combustion engine and the like, having a battery and electrically operable engine starting means including a starter solenoid and an ignition coil, said apparatus having remote manual switch controlled circuit means connectable to a voltage source, first switch means including a plurality of switches and a therefor operating plural pole relay disposed in said circuit means, second switch means including a second switch and therefor operating second relay disposed in said circuit means, and circuit wires connecting said battery to said starter solenoid through said second switch when said second relay is actuated, to said ignition coil through a first of said plurality of switches when actuated and to the electromagnetic coil of said plural pole relay through a second of said plurality of switches when actuated for operating said ignition coil directly from the battery after disconnection from the voltage source by actuation of said first of the plurality of switches by the plural pole relay, carburetor means including a lever controlling flow of fuel to said engine, the improvement comprising a circuit mechanism including a selector switch for selectively connecting said circuit mechanism to opposite sides of the voltage source; a carburetor control solenoid connected to said lever, said circuit mechanism including circuit wires connected to said battery and said carburetor control solenoid, and current flow control means disposed in said circuit mechanism, whereby the battery is energized when said selector switch connects the circuit mechanism to one side of a voltage source and said carburetor solenoid is actuated when said selector switch connects the circuit mechanism to the other side of the voltage source.

4. The apparatus defined in claim 3 further characterized by a variable resistance disposed in said circuit mechanism for variably controlling the solenoid, and a switch controlled rapid accelerator shunt mechanism in parallel with said variable resistance, whereupon energization of the carburetor solenoid through said shunt said lever is rapidly actuated to quickly speed the engine.

5. The apparatus defined in claim 3 in which said internal combustion engine has carburetor means including a lever controlling the flow of fuel to said engine, said apparatus further characterized by a carburetor solenoid connected to said lever and to said circuit mechanism, and a pair of rectifiers disposed in said circuit mechanism, whereby said circuit mechanism can be selectively connected to each side of a voltage source to selectively energize the battery and said carburetor solenoid.

6. In apparatus for remotely controlling the starting of an internal combustion engine and the like having a battery and electrically operable engine starting means including a starter solenoid and an ignition coil, said apparatus comprising circuit means having a starting switch for selectively connecting each side of a voltage source with said circuit means, a first relay including a triple pole double throw normally open first switch in said circuit means, a second relay including a single pole double throw normally open second switch in said circuit means, first circuit wires connecting said battery to said ignition coil through a first pole of said first switch when closed, second circuit wires connecting said battery to the electro-magnetic coil of said first relay through a second pole of said first switch when closed, third circuit wires connecting said battery to said starter solenoid through the pole of said second switch when closed, for energizing said starter solenoid and said ignition coil when said starting switch connects the circuit means to the voltage source and holding said ignition coil energized after the voltage source and said circuit means are disconnected by energization of said first relay from said battery to close said first switch, the improvement comprising means for opening said first switch once closed and deenergizing said ignition coil and comprising a third relay including a normally closed third switch in said circuit means, and rectifier means connected in said circuit means for directing current from one side of a voltage source to said first and second relays and current from the opposite side of the voltage source to the third relay, whereby said third relay can be selectively switched into communication with the voltage source by said starter switch to selectively open said third switch to open said circuit means and deenergize said first relay and open said first switch.

7. The apparatus defined in claim 6 and having means for opening said first switch once closed and deenergizing said ignition coil and comprising a third relay including a normally closed third switch in said circuit means, and rectifier means connected in said circuit means for directing current from one side of a voltage source to said first and second relays and current from the opposite side of the voltage source to the third relay, whereby said third relay can be selectively switched into communication with the voltage source by said starter switch to selectively open said third switch to open said circuit means and deenergize said first relay and open said first switch.

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