

Oct. 22, 1940.

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2,218,847

ELECTRICAL SYSTEM FOR MOTOR VEHICLES

Filed Nov. 16, 1939

2 Sheets-Sheet 1

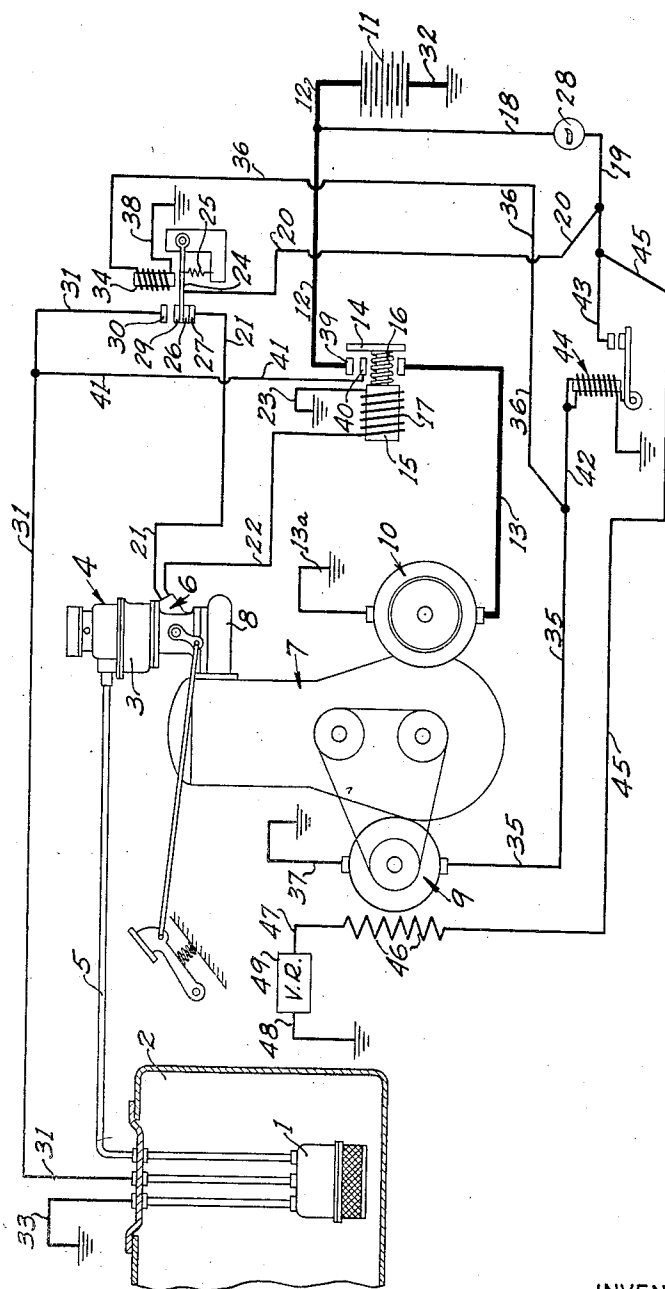


FIG. 1

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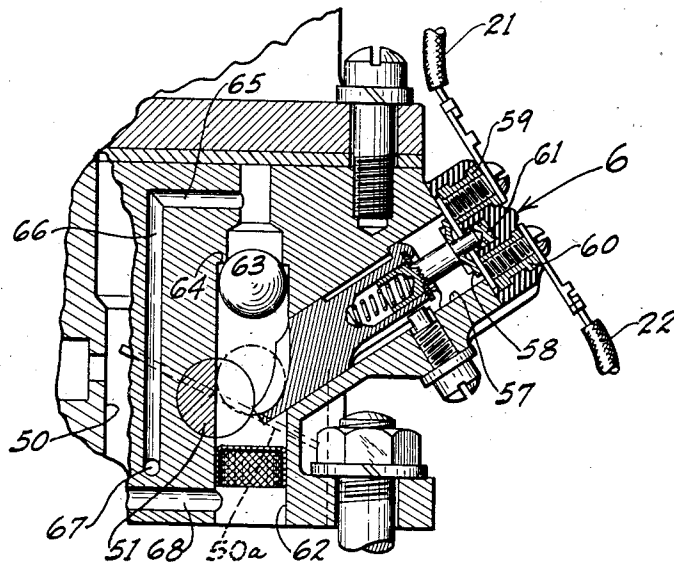


FIG. 2.

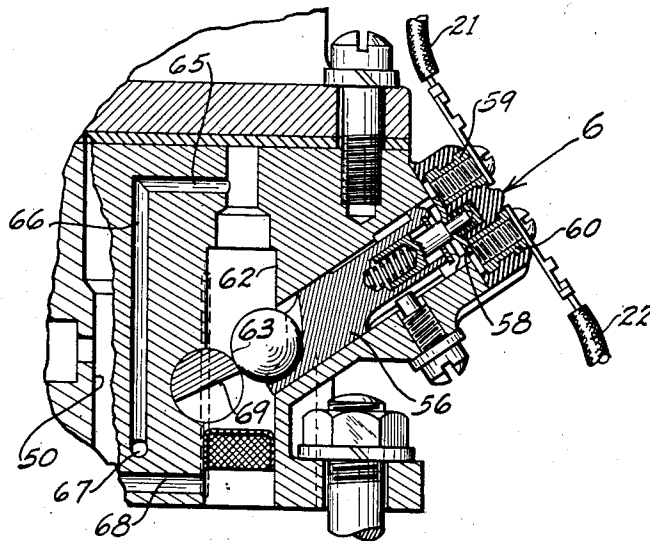


FIG. 3.

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2,218,847

ELECTRICAL SYSTEM FOR MOTOR VEHICLES

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Application November 16, 1939, Serial No. 304,747

10 Claims. (Cl. 290—36)

This invention relates to electrical systems for motor vehicle engines and more particularly to systems of this character which include electric fuel pumps and starting motors. It is an improvement of our co-pending application, Serial No. 304,746, filed November 16, 1939.

The present invention has for its primary object the provision of an improved electrical system of the above character which includes automatic and semi-automatic control devices whereby the safe and satisfactory operation of the electric fuel pump and starting motor is insured.

Other objects and advantages will become apparent upon reference to the following description and accompanying drawings in which:

Fig. 1 is a diagrammatic representation of an electrical system for motor vehicle engines according to our invention.

Figs. 2 and 3 are enlarged sectionalized views of the throttle actuated starter switch, each showing a different operative position.

Reference numeral 1 indicates an electrically driven centrifugal type fuel pump mounted in a fuel storage tank 2 and arranged to deliver fuel from the tank to the constant level chamber 3 of the carburetor generally indicated at 4 through a fuel conduit 5. The carburetor 4 is of the conventional downdraft type having a mixing conduit 50 and a throttle valve 50a mounted therein for rotation on a transverse throttle shaft 51. The carburetor is also equipped with a throttle actuated starting switch generally indicated at 6. This switch is similar to the throttle actuated starting switch disclosed in the patent to I. E. Coffey #2,174,313 and is arranged to be closed by throttle opening movements when the engine is inoperative. An internal combustion engine is indicated at 7, having an intake manifold 8 to which the carburetor is suitably attached. A generator 9 arranged to be driven by the engine in the usual manner and a starting motor 10 arranged to crank the engine are indicated. A storage battery is indicated at 11.

To energize the starting motor a lead 12—13 from the battery is provided having a switch 14 operated by a solenoid 15 interposed therein. The switch 14 is normally held open in the position shown by a spring 16. The starting motor is grounded at 13a. The winding 17 for the solenoid is included in a secondary starting switch circuit 12—18—19—20—21—22 and ground lead 23. This circuit is controlled by a second solenoid operated switch 24 and by the throttle actuated switch 6. Throttle actuated switch 6 is arranged in the lower carburetor casting adjacent the

throttle valve and comprises a plunger 56 slidably mounted in a bore 57. Plunger 56 carries a switch blade 58 at its outer end which is arranged to electrically connect a pair of terminals 59 and 60 as the plunger is moved outward. Leads 21 and 22 are attached to terminals 59 and 60. A spring 61 which normally urges plunger 56 inward to break this electrical connection is provided. Extending upwardly and intersecting the transverse throttle shaft 51 and the bore 57 is a vertical bore 62 which receives a ball 63. A shoulder 64 which provides a seat for ball 63 is formed near the upper end of bore 62 by a reduction in diameter. The upper end of bore 62 communicates with the mixing conduit 50 at a point posterior to the throttle valve by reason of passages 65, 66 and port 67. The lower end of passage 62 communicates with the atmosphere by reason of passage 68. A cam surface 69 is formed on throttle shaft 51 at the point of its intersection with bore 62.

When the engine to which the carburetor is attached is inoperative, the pressure in the mixing conduit will be atmospheric and if the throttle valve is in a nearly closed position, the ball 63 will drop to the position as shown by dotted lines in Fig. 2. If the throttle shaft 51 is now rotated in a valve opening direction (clockwise), plunger 56 will be moved outward to a position as shown in Fig. 3, thereby closing the starting circuit. When the engine is in operation, the ball 63 will be lifted to its seat 64 by suction upon the first closing movement of the throttle valve, where it will remain during normal operation of the engine. The switch 24 is normally held in the position shown by a spring 25 causing contacts 26 and 27 to be closed, the throttle actuated switch 6 is normally held open by spring means. A key operated switch 28 is also indicated in this circuit. This switch may be the usual ignition switch through which ignition devices (not shown) are usually connected to the battery.

The switch 24 is further provided with contacts 29 and 30 which when in contact close a circuit 12—18—19—20—31 which includes the battery 11, the fuel pump 1 and their respective ground leads 32 and 33. The solenoid 34 which operates the switch 24 is included in a generator armature circuit 35—36, and armature and solenoid ground leads 37 and 38.

A second circuit including the battery 11 and the fuel pump 1 consists of lead 12, a contact 39, switch blade 14, a contact 40, lead 41—31 and the battery and fuel pump ground leads 32 and 33. This circuit and the starting circuit are closed

simultaneously when the solenoid 15 is energized.

A charging lead 35—42—43—19—18—12 from the generator to the battery includes the usual reverse current relay generally indicated at 44. The generator field is separately excited by means of the circuit 12—18—19—45, field winding 46, lead 47, ground lead 48 and battery ground 32. The field winding 46 is grounded through a conventional voltage regulator indicated at 49 which functions to control the generator output voltage in a well known manner.

The purpose of separately exciting the generator field is to cause an induced flow of energy from the battery through the armature circuit at low or idling engine and generator speeds. By this provision sufficient energy is transmitted at low speeds from the battery to solenoid 34 to cause switch 24 to break the auxiliary starting circuit and hold closed the battery-fuel pump circuit.

The operation of the device is as follows:

Assuming the engine 7 to be in condition for starting, as the throttle is moved to a predetermined position the switch 6 will function to close the starting relay circuit in a manner more fully described in the Coffey Patent #2,174,313. The auxiliary starting circuit 12—18—19—20—21—22—17—23 will thereby be closed and the solenoid 15 will be energized, closing switch 14 causing the engine to be cranked. It is assumed that the key switch 28 is closed at this time. Simultaneously with the closing of the starting circuit the battery-fuel pump circuit 12—41—31—33 will be closed causing the operation of the electric fuel pump while the engine is being cranked.

As soon as the engine begins to operate under its own power the generator output will energize solenoid 34 which will, in turn, part contacts 26 and 27 thus breaking the auxiliary starting circuit and at the same time close contacts 29 and 30 thus closing the battery-fuel pump circuit 11—12—18—19—20—31—1—35—32 which will remain closed as long as the engine continues to operate and drive the generator.

We claim:

1. In combination, an internal combustion engine, means for cranking said engine, a carburetor having a control valve, a fuel pump for supplying fuel to said carburetor, a source of power for the operation of said cranking means and said fuel pump, and a control system cooperative with said carburetor control valve when said engine is inoperative for operatively connecting said cranking means and said fuel pump to said source of power.

2. In combination, an internal combustion engine having an intake manifold, an electric cranking motor, an electric fuel pump, a carburetor having a control valve, a source of electrical energy, an electrical control device cooperative with said carburetor control valve for electrically connecting said cranking motor and said fuel pump to said source of energy, and means responsive to intake manifold suction for preventing the cooperation of said carburetor control valve and said electrical control device.

3. In combination, an internal combustion engine having an intake manifold, a carburetor having a control valve, an electric fuel pump, a source of electrical energy, an electrical control device cooperative with said carburetor control valve for electrically connecting said fuel pump to said source of energy, and means responsive to intake manifold suction for preventing the

cooperation of said carburetor control valve and said electrical control device.

4. In combination, an internal combustion engine having an intake manifold, an electric cranking motor, a carburetor having a control valve, an electric fuel pump, a source of electrical energy, an electrical control device cooperative with said carburetor control valve for electrically connecting said cranking motor and said fuel pump to said source of energy, means responsive to intake manifold suction for preventing the cooperation of said carburetor control valve and said electrical control device and means dependent upon the operation of said engine for electrically connecting said fuel pump to said source of energy.

5. In an internal combustion engine having an electric cranking motor, an electric fuel pump, a storage battery and a carburetor having a control valve, a solenoid operated switch arranged to jointly connect said cranking motor and said fuel pump to said battery when energized, and means cooperative with said carburetor control valve for energizing said solenoid switch.

6. In an internal combustion engine having an intake manifold, an electric cranking motor, an electric fuel pump, a storage battery and a carburetor having a control valve, a solenoid operated switch arranged to jointly connect said cranking motor and said fuel pump to said battery when energized, means cooperative with said carburetor control valve for energizing said solenoid switch and means responsive to intake manifold suction for preventing said cooperation.

7. In an electrical system for internal combustion engines, an electric cranking motor, an electric fuel pump, a storage battery and a carburetor having a control valve, switch means coacting with said carburetor control valve for electrically connecting said cranking motor and said fuel pump to said storage battery.

8. In an electrical system for internal combustion engines, an electric cranking motor, an engine driven generator, an electric fuel pump, a storage battery and a carburetor having a control valve, switch means coacting with said carburetor control valve for electrically connecting said cranking motor and said fuel pump to said storage battery and means responsive to the rotation of said generator for disconnecting said cranking motor.

9. In an electrical system for an internal combustion engine having an intake manifold, an electric cranking motor, an engine driven generator, an electric fuel pump, a storage battery and a carburetor having a control valve, switch means coacting with said carburetor control valve for electrically connecting said cranking motor and said fuel pump to said storage battery, means responsive to the rotation of said generator for disconnecting said cranking motor, and means responsive to suction for preventing the coaction of said control valve and said switch means.

10. In an electrical system for internal combustion engines, an electric cranking motor, an engine driven generator, an electric fuel pump motor, a storage battery, a switch device for simultaneously electrically connecting said cranking motor and said fuel pump to said storage battery, and means responsive to the rotation of said generator for disconnecting said cranking motor from said battery.

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