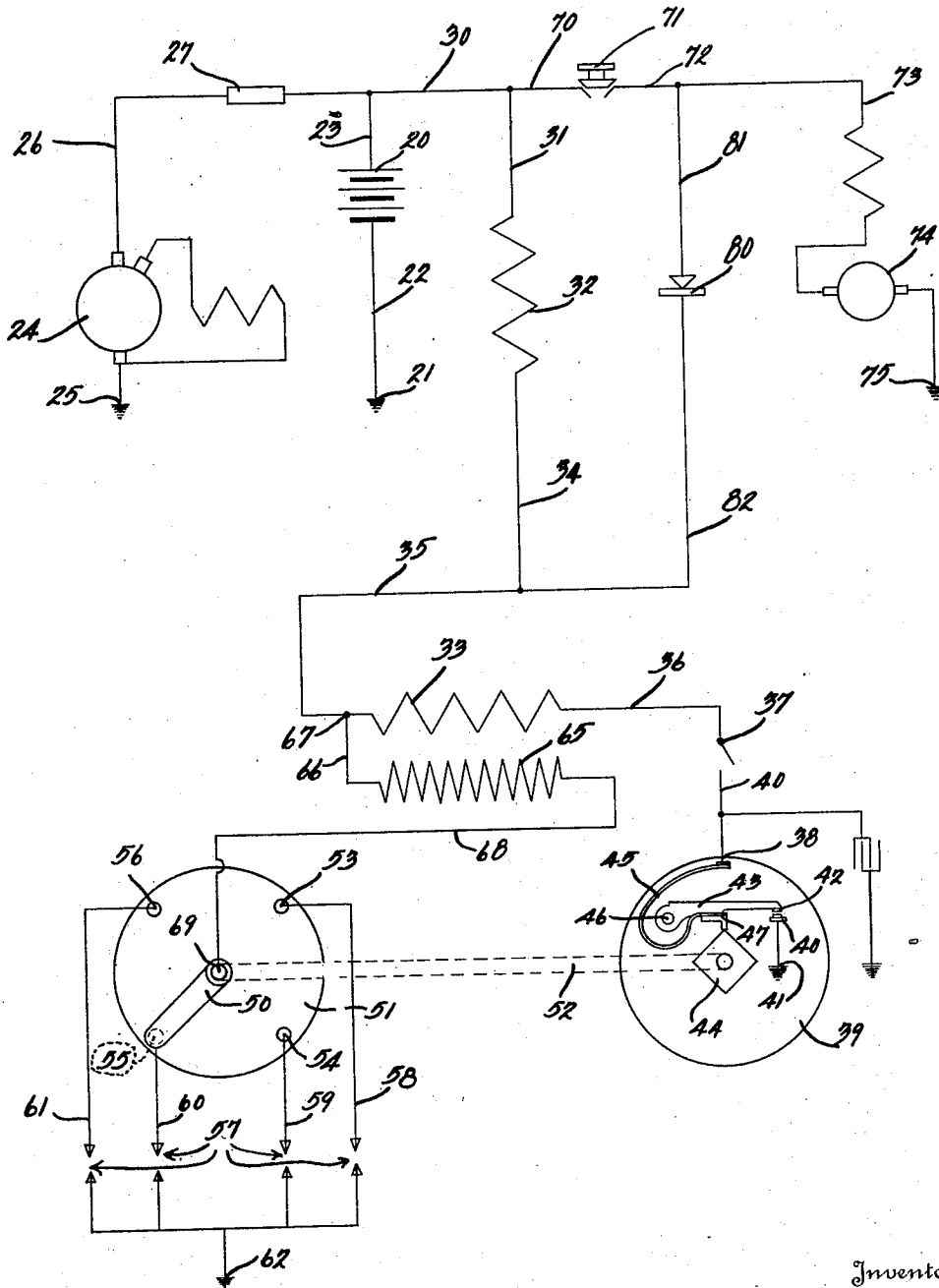


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MOTOR STARTING CIRCUIT
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MOTOR STARTING CIRCUIT

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This invention relates to automotive electric systems, and is particularly concerned with the ignition and starting circuits.

One of the objects of the instant invention is to provide adequate means for increasing the primary ampere turns in the ignition circuit at the time of starting.

A further object of the invention is to augment the current impression upon an ignition circuit, at a time when considerable energy is being drawn from a common source, as in the instance of driving the starting motor.

A further object of the invention is to provide a system and means of the type indicated that will be substantially automatic in its operation.

A further object of the invention is to improve ignition and starting circuits in general.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawing wherein a preferred embodiment of one form of the present invention is clearly shown.

In the drawing:

The accompanying diagram illustrates a circuit of the electrical connections in this improved system.

Referring particularly to the drawing, 20 indicates a source of current as a battery B having a ground connection at 21 by lead 22, and a feed line 23 from which various circuits are made through the agency of proper connections. One of these circuits is a charging circuit including a generator or charging unit 24 grounded at 25 and connected with the common conductor 23 by means of a lead 26, there being a cut-out relay 27 interposed between the generator and battery all as is well known to those skilled in the art.

A second circuit emanating from the battery source 20 is the ignition circuit and includes a conductor 30 to which is joined a lead 31 in communication with one end of a fixed resistance 32 that has electrical communication with the primary winding 33 of an ignition coil by means of proper conductors 34 and 35. After traversing the primary

winding the energy of the battery source passes along a lead 36 to an ignition switch 37, which if closed communicates with a terminal 38 of a timer mechanism 39 by means of a lead 40. The timer 39 is of conventional form including a fixed contact point 40 grounded as at 41, and a movable contact point 42 carried by an arm 43 that is urged to follow the contour of a cam 44 by reason of a spring 45 in electrical communication with the terminal 38 heretofore mentioned.

The lever 43 is pivoted to the circuit breaker 39 as at 46, and includes a rubbing block 47 engaging the surface of the cam 44. The circuit breaker cam is in substantial rigid driving relation with a rotor 50 of a distributor 51 by means of a common shaft 52, and it is understood that rotation of the cam 44, in addition to producing the periodic movement of the circuit breaker lever 43 to open and close circuits through the contacts 40 and 42, will drive the distributor arm 50 in timed relation therewith, all as is usual and well known to those experienced in the art. The distributor 51 further includes spaced terminals 53, 54, 55, 56 and the like, that have electrical communication with the spark gaps 57, there being one for each cylinder of the vehicle, by reason of the respective leads 58, 59, 60 and 61, the opposite side of the gaps having a grounded connection as at 62, usually forming the engine block.

A secondary winding 65, inductively associated with the primary 33 has electrical communication with the lead 35 by conductor 66 joined at 67, and thence by way of conductor 68 forms a path of electrical communication with the rotor 50, where it may be connected as at 69.

It is obvious that voltage impression from the source 20 through the resistance 32 upon the primary winding 33 will induce a current of high potential upon the secondary 65, dependent upon the relation of the windings 33 and 65, and that rotation of the timer shaft 52, as it is called, will produce periodic breaks in the primary circuit which will in effect produce similar periodic impressions along the secondary circuit, and the break of the primary circuit being timed with the movement

of the rotor 50, sparking impulses of high potential will be delivered in proper sequence over the distributor terminals 53 and 56 inclusive, which will be manifest at the associated gaps 57. During normal running or operation of the vehicle the resistance of the ignition circuit is of such magnitude as to allow passage of sufficient current to the primary 33 for the greatest efficiency of operation of the engine.

A third circuit connected with the common source 20, is that of the starting motor and includes a conductor 70, with a starting motor switch 71 and a lead 72, making connection with the proper conductor 73 of a starting motor 74 grounded at 75, it being obvious that depression of the switch 71 will bridge the conductors 70 and 72, so as to energize the starting motor circuit, as is usual and well known to those skilled in the art. Practice demonstrates that when the switch is actuated or the starting motor circuit is energized, the draft of energy from the single source is usually so great as to leave insufficient current for the ignition circuit for proper operation, and if the voltage pressure of the source should be low to start with, it is probable that the voltage impression upon the primary 33 would be too low to produce effective sparking impulses at the gap 57, or that would result in ready and proper firing of the cylinder charge.

To overcome this difficulty a by-pass, asymmetric cell or rectifier 80, is therefore hooked in parallel about the resistance 32, by means of a lead 81 connected to the lead 72 and a second conductor 82 joining with the conductor 35. This, in effect, introduces a one-way valve into the ignition circuit, so as to automatically cut out the resistance in the normal ignition circuit whenever the starting motor circuit is energized. It will be observed that closing of a circuit through the conductor 70 and 72 by the switch 71, also closes a circuit through the electric valve or asymmetric cell 80, thus, forming a path of lesser resistance through the primary circuit of the ignition system, since current from the source 20 will traverse the cell 80 more readily than it will the relatively high resistance 32.

From the above disclosure it will be seen that means have been devised for automatically reducing the resistance of the ignition circuit, whenever, and at every time, the automotive engine is started. This occurs by reason of the fact that the valve 80 is in parallel with the resistance 32 and is switched into the ignition circuit coincident of the closing of the starting motor circuit. The valve 80 is preferably of the dry type, such as that disclosed in the patent to Lucien Levy No. 1,671,247, in which use is made of a copper oxide layer intermediate a copper plate and a lead plate.

Although this type of valve or rectifier is

preferable from the applicant's standpoint, the invention is not limited to that particular type as any other suitable rectifier may be used. But at all events the characteristics of the rectifier are that it shall have a very low resistance to currents passing in one direction, as for instance, currents passing from the source through the switch 71, the valve 80, and thence to the conductor 35, while it shall have a very high resistance, or pass no currents in the reverse direction. It is readily seen that when a valve of that type is hooked into the ignition circuit parallel to the resistance 32 as applicant has done, that automatic control for altering the condition of the primary ampere turns of the ignition coil during starting is provided, and that currents will readily pass from the battery through the primary winding about the resistance 32 whenever the switch 71 be actuated, yet there will be no possibility of currents being conducted across the valve in the reverse direction irrespective of whether or not the switch 71 is closed.

Means are therefore provided that preclude any accidental draining of the current source, or provide a ground circuit for the ignition system. That is to say, by the interposition of the resistance coil 32 in series with the main or ignition primary circuit, there will be provided a good conductor for the normal flow of current through the said circuit, but if, for any reason, an abnormal or continuous flow of current is created through this main circuit, such as might occur if the motor should stop with the timer contacts in engagement, the resistance coil 32 will tend to heat up and by reason of the consequent increase in resistance, the abnormal flow of current will be gradually tapered off until that flow of current through the circuit is practically reduced to a negligible quantity. Thus the source will be prevented from rapidly draining out. On the other hand, regarding a possible drain circuit that might exist between the source 20 and the motor 74 through the resistance 32 and thence by way of the conductors 34 and 82 that might be regarded as by-passing the switch 71, there is no opportunity for the drain of the source over that circuit through the starting motor inasmuch as the asymmetric cell 80 precludes the passage of any current therethrough except in the direction toward the primary 33. Further, when the starting motor circuit is closed the available battery current that remains is by-passed around the resistance 32 and is sufficient to energize the primary coil 33 which would not obtain if passed through the resistance 32. The spark manifestation at one or another of the gaps 57 will therefore be considerably greater than would obtain if the same available remainder of current were to be impressed upon the primary 33 after passing through the resistance 32.

While the form of embodiment of the present invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. A motor starting circuit comprising in combination, a normal path of resistance for engine operation, a shunted path for energizing a starting motor, and a by-pass about the resistance in said engine operation path, said by-pass including a unidirectional current carrying device, and means for coupling the by-pass into the engine operating circuit only when said starting motor is energized.

2. An automotive ignition circuit comprising in combination, a primary path including a source of current and inductive windings, a path of resistance normally joining the source and inductive windings, a starting motor shunt also connected with said source and a by-pass including a unidirectional electric valve arranged in parallel with said resistance, the closing of said starting motor circuit coincidentally connecting the by-pass with the source.

3. An automotive ignition and starting circuit comprising in combination, a source of current, inductive windings, means connecting said source and windings, and a starting motor to be energized from said source, said connecting means including parallel paths, one of which includes a fixed resistance, and the other a by-pass with unidirectional current carrying means thereabout, means for closing the circuit through the starting motor and coincidentally by-passing the source current about said resistance.

4. An automotive ignition and starting circuit comprising in combination, a current source, an inductive winding, and a path of normal resistance therebetween, a unidirectional electric valve in parallel with said resistance, and means for including the valve in the ignition circuit upon energization of the starting motor.

5. In an electrical system of the class described, a normal path including a resistance, a shunt including a work device and means for connecting the same with a common source of current, and a unidirectional electric valve for by-passing the resistance upon energization of the work device.

6. In an electrical system of the class described, the combination comprising, an ignition circuit, a starting motor circuit, a current source supplying both circuits, said ignition circuit including a resistance and a primary winding, an asymmetric cell in parallel with said resistance, and means for short circuiting the resistance through said cell in order to impress upon the primary a higher voltage than is normally obtainable through said resistance.

7. In an electrical system of the class de-

scribed, the combination comprising, an ignition circuit including a resistance and the primary windings of an ignition coil, a starting motor circuit joining the ignition circuit between the battery and resistance, and including a starting motor switch, a parallel branch in said ignition circuit energizable coincident with said starting motor circuit, and means connected in said parallel branch to by-pass said resistance, said means being capable of passing current from a common source to the ignition primary but being incapable of passing current in the reverse direction.

8. In an ignition circuit, a switch, a shunt including a rectifier, said rectifier operating to increase the primary ampere turns in said circuit during the closing of said switch.

9. In an ignition circuit, switching provisions, an auxiliary circuit including means permitting the passage of current in a single direction, said means increasing the primary ampere turns of said circuit upon actuation of said provisions.

In testimony whereof I hereto affix my signature.

JOHN T. FITZSIMMONS.