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SYSTEM OF SELECTIVE ELECTRICAL DISTRIBUTION.
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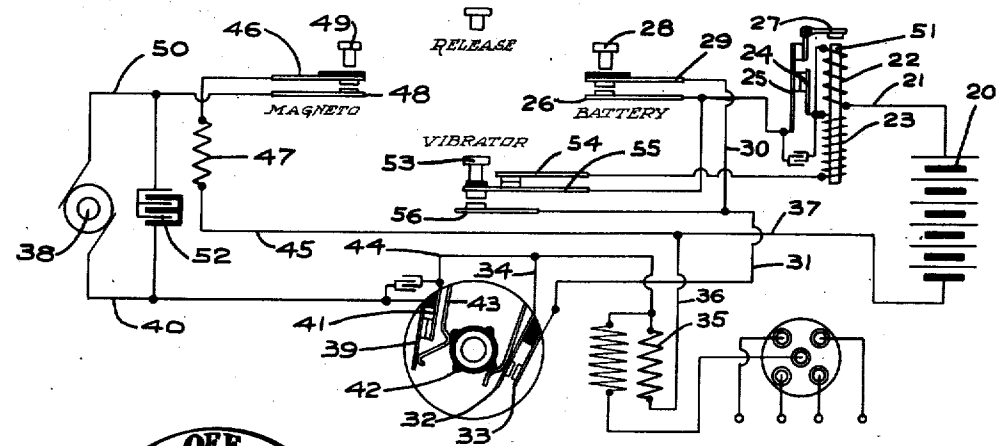


Fig. 1

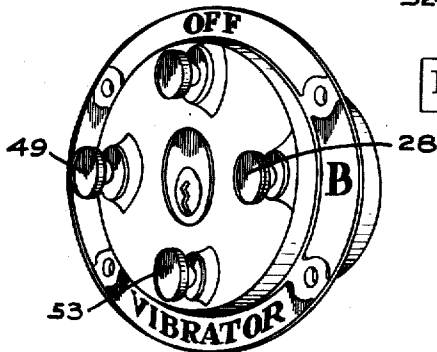


Fig. 2

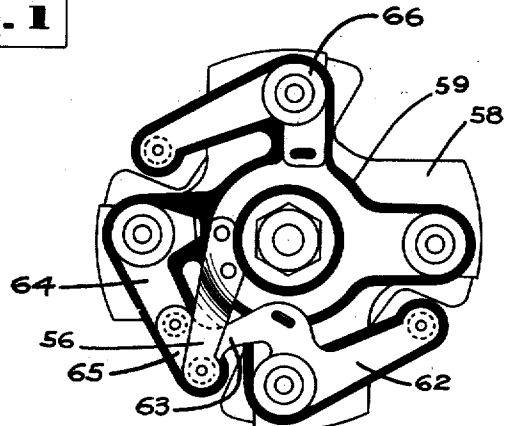


Fig. 3

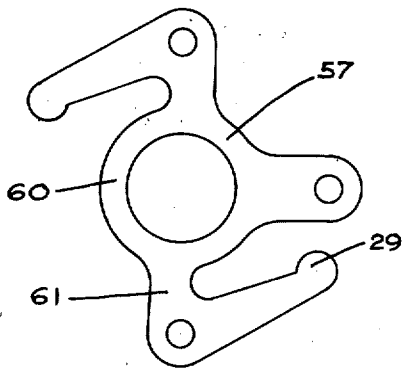


Fig. 4

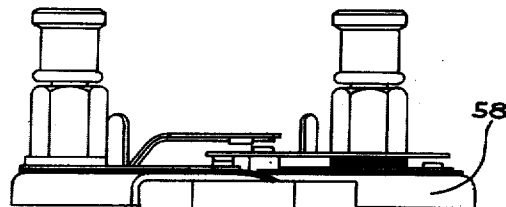


Fig. 5

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SYSTEM OF SELECTIVE ELECTRICAL DISTRIBUTION.

1,259,995.

Specification of Letters Patent.

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Original application filed November 20, 1912, Serial No. 732,483. Divided and this application filed March 4, 1916. Serial No. 82,127.

To all whom it may concern:

Be it known that we, CHARLES F. KETTERING and WILLIAM A. CHRYST, citizens of the United States of America, residing at Dayton, county of Montgomery, and State of Ohio, have invented certain new and useful Improvements in Systems of Selective Electrical Distribution, of which the following is a full, clear, and exact description.

10 This invention relates to an improvement in electrical systems and especially to that type of system employed in conjunction with combustion engines, for furnishing ignition thereto and for various other purposes.

15 In providing ignition systems for combustion engines, it is often advisable to provide a plurality of types of ignition, one type of said ignition being particularly advisable for use under certain conditions, while another type may be better adapted for use under other conditions, or there may be times when the different types can be advantageously used together.

20 In certain types of ignition systems, however, mechanism or devices are included which tend to create electrical lag, so that if an ignition system having a determined amount of lag, is used concurrently with another type of ignition which is free from lag or which has a less amount than the first type of system, the ignition will not take place concurrently.

25 It is among the objects of the present invention to compensate for the lag which may be present in certain of the ignition systems and thereby permit the use of a plurality of ignition systems to furnish ignition to an engine, either independently or concurrently.

30 Another object of the present invention is to provide a switch embodying controlling elements for controlling the above mentioned ignition systems, said switch including latching mechanism, whereby the controlling elements may be maintained either independently or in combination in operative position.

35 This application is a division of our co-pending application, Serial No. 732,483, filed November 20, 1912.

Further objects and advantages of the present invention will be apparent from the following description, reference being had

to the accompanying drawings, wherein preferred embodiments of the present invention 55 are clearly illustrated:

Referring to the drawings:

Figure 1 is a diagrammatic view showing the electric circuits and connections which may be advantageously embodied in the 60 present invention.

Fig. 2 is a front perspective view of the switch casing assembly preferably embodied in systems similar to those shown in diagrammatic Fig. 1.

Fig. 3 is a view in elevation of the switch unit, comprising the contact elements and supporting plates included in the present invention.

Fig. 4 is a detail view of the common 70 contact plate.

Fig. 5 is a view in elevation of the structure shown in Fig. 3, some of the parts being omitted, however, for the sake of clear- 75

Referring to the drawing there is illustrated a system of electrical distribution for ignition systems of what is known to the trade as dual type ignition; that is, where there is but a single induction coil, a single 80 set of spark plugs and a single timing element, and a plurality of current sources. These current sources may be of either the constant supply type, such as batteries of the dry-cell type, or those sources wherein 85 current is supplied by a driven element or machine such as a magneto or generator.

In the following description reference is made to "battery type ignition" and to "magneto type ignition." This selection of 90 terms is made in order to facilitate the description.

Referring to the drawing, the "magneto type of ignition" includes the electric machine 38, which, in the present form of the 95 invention, comprises an electric generator which is provided with circuit connections with the storage battery 52.

The "battery type of ignition" includes the source of current indicated by the numeral 20, which may be a battery of the dry-cell type.

The "battery type of ignition" will first be described.

Referring to Fig. 1, the numeral 20 designates a battery of any suitable type, which 100

has a wire or connection 21 extending from one pole thereof to a current interrupter, such as is shown in the co-pending application of Charles F. Kettering, Serial No. 5 548,921, filed March 12, 1910, and which comprises a heavy winding 22 and a fine winding 23.

In our co-pending application, Serial No. 732,483, filed November 20, 1912, which 10 eventuated into U. S. Letters Patent No. 1,211,378, the operation of this interrupter is clearly described, and it is therefore deemed unnecessary to include further description thereof in the present application.

15 The heavy winding 22 of this interrupter is connected to a contact plate 24, which in turn normally contacts with the contact plate 25, which in turn is connected to the switch plate 26. The armature 27 of the interrupter 20 referred to heretofore, is adapted, when brought into attracted position, to separate the contact plate 24 from the plate 25, as will be described hereinafter, and at such times as the switch button or controlling ele- 25 ment 28 is depressed, the circuit will be completed through the contact plates 26 and 29, wire 30, wire 31, to contact plates 33 and 32, conductor 34, through the primary winding of the induction coil 35, back to the oppo- 30 site side of the battery, via the conductors 36 and 37.

However, due to the operation of the interrupter which has been referred to above, as soon as the armature 27 moves the con- 35 tact plate 25 away from the contact plate 24, the main circuit will be broken, thus creating the sparking impulse. However, the fine wire coil or winding is included in the main circuit and tends to maintain the armature 40 27 in position to break the contacts 25 and 24 until such time as the contacts 32 and 33 are separated. It is by this arrangement that the single spark, battery type of ignition is secured.

45 The magneto type of ignition will now be described. This type of ignition includes a dynamo-electric machine 38 electrically connected with the storage battery 52. One of the terminals of the electric machine 38 is 50 connected to the contact plate 39 of the timer by means of the conductor 40. The element 39 is normally in closed position with the contact plate 41, and is adapted to be intermittently separated therefrom by means 55 of the engine actuated timer cam 42, operating relative to the spring finger 43. This same cam 42 also tends to close and open the contact plates 32 and 33, described above as being included in the circuit of the single 60 spark, battery type ignition system.

The wire 44 leads from the contact plate 41 and connects with the common wire 36, which includes the primary winding of the induction coil 35. This common connection 65 36 is tapped onto the wire 45, which in turn

extends to the contact plate 46. A resistance coil 47 is connected in series with the conductor 45. The function and construction of this resistance coil forms the subject matter of the U. S. patent to C. F. Kettering, No. 70 1,223,180, dated April 17, 1917, and a further description of the same in the present application is not deemed necessary.

The contact plate 46 is adapted to be brought into closed position with the plate 75 48 by means of the push button element 49.

The wire 50 connects the plate 48 with the opposite side of the machine 38, and thus completes the circuit.

From the above description, it will be seen 80 that the sparking impulse on the side of the system having the generator 38 as its current source is created by breaking the normally closed circuit, through the operation of the engine actuated timer cam. 85

In the battery system, however, the timer cam 42 simply tends to initially close and complete the battery circuit through the heavy winding of the interrupter, so that no sparking impulse is created until such a time 90 as the core of the current interrupter has become sufficiently energized to attract the armature 27, and thus break the main circuit by separating the contacts 24 and 25.

From the above, it will be seen that the 95 current interrupter which is included within the battery circuit, causes a certain amount of delay in the time of occurrence of the spark, as compared with a system wherein the sparking impulse is created by directly 100 breaking the generator circuit.

This delay will be termed the "time constant of the current interrupter."

In the present form of the invention, however, provision has been made to so arrange 105 the making of the battery circuit and the breaking of the generator circuit, by the engine actuated timer, that this time constant of the current interrupter will be compensated for, so that the time of occurrence of 110 the sparking impulse in each system will take place practically synchronously, provided that each system is concurrently in action.

The manner of compensating for this time 115 constant of the interrupter will be fully described hereinafter, and it is thought, by referring to diagrammatic Fig. 1, that this above arrangement, together with certain of the other circuit arrangements and connec- 120 tions, will be fully understood, when taken in connection with the following description.

Referring particularly to Fig. 1, let it be supposed that it is desired to bring the single 125 spark relay type of battery ignition into operation. The button 28 is first depressed, so as to close the contact elements 29 and 26, which will immediately close the main circuit, provided, of course, that the engine 130

timer is in such position as to close the contact between the plates 32 and 33.

The current will then flow from the battery 20, through wire 21, heavy winding 22, contact elements 24 and 25, contact plates 26 and 29, electrical connections 30 and 31, contact plates 33 and 32, back through the branch wire 34, through the primary winding of the induction coil 35, wire 36, to the opposite side of the battery 20, via the wire 37.

Of course, as soon as the core 51, of the current interrupter becomes sufficiently energized, it will actuate the armature 27 in such a manner as to break the circuit by separating the contact points 24 and 25. However, upon the breaking of the main circuit by this action, a small amount of current will continue to flow through the fine winding 23, and thus maintain the armature in circuit breaking position.

Again, supposing that it is desired to employ the magneto type ignition system, the button 49 will be depressed to close the contact elements 46 and 48, so that current will flow from the dynamo electric machine 38, or storage battery 52, through the wire 40, contact plates 39 and 41, branch wire 44, through the primary winding of the induction coil, connecting wire 36, through the wire 45, resistance element 47, contact plates 46 and 48, back to the generator or to the opposite side of the storage battery, via the wire 50.

By referring to Fig. 1, it will be noted that the contact plates 32 and 33, which constitute a part of the battery circuit, when closed through the operation of the engine timer, are not arranged diametrically opposite to the contact plates 41 and 39, which constitute a portion of the generator circuit. The plates 32 and 33 are so offset that the timer cam will tend to operate the contact plates 32 and 33, to close the circuit, previous to its operation to break the generator circuit.

These plates 32 and 33 are offset sufficient to compensate for the time constant of the interrupter contained in the battery circuit, so that although the opening of the generator circuit and the closing of the battery circuit, by the operation of the engine actuated timer cam, will occur at different times, the time of occurrence of the spark in each of said circuits or systems will be practically synchronous.

Now, under certain conditions, it may be desirable to employ a vibrating spark for effecting the ignition of the engine.

This effect, that is, the securing of the vibrating spark, may be secured in the present instance by depressing the button 53, so as to break the connection between the contacts 54 and 55, thus opening the circuit connected with the fine wire winding 23, and

concurrently establishing the main circuit through the heavy winding 22 of the current interrupter, by closing the contact plates 55 and 56.

It is not thought necessary to describe the course of the current through the various circuit connections, under the above conditions, inasmuch as it will readily be understood that by opening the holding coil circuit, that is, the circuit which includes the fine wire winding 23, and simultaneously or concurrently closing the main battery circuit through the heavy winding 22, the current interrupter will be converted into an ordinary vibrating coil.

In a switch capable of being employed in the present improved system, it is preferable to provide what may be termed a common contact element 57, such as is shown in detail in Fig. 4.

This element is mounted upon a supporting plate 58, but is insulated therefrom by the backing 59.

The common contact element in the present instance is provided with a body portion 60, which has extending therefrom, an arm element 61, which terminates in the contact finger or plate 29.

When the switch unit is assembled, this contact plate or finger 29 will directly overlie the independent contact element 62. This independent contact element is secured to the supporting plate 58, by means of the terminal or binding post, which also secures the arm 61, of the common contact plate 57, to the support 58. Suitable insulation separates the element 62 from the contact finger 29.

The opposite end of the element 62 constitutes a contact plate 63, which carries a plurality of contact points to accomplish the functions set forth hereinafter. For instance, one of the contact points of this plate 63 directly underlies and is in constant contact with a portion of the independent contact element 64, which has no connection with the common contact element 57, but which is secured to the support 58, by means of a suitable binding post.

This independent element 64 and the contact plate 63, in reality, constitute a portion of the holding or fine wire coil circuit, which is adapted to be broken in the manner set forth hereinbefore, by the operation of the button 53.

In order that the main circuit may be completed by a single operation of the button 53, concurrently with the opening of the fine wire coil circuit, the contact plate 56 is mounted directly on the common contact element 57, and is so arranged that its free end will underlie and be normally spaced from the contact point 65, carried by the element 62.

The common contact element 57 carries the

terminal post 66, which is insulated from the supporting plate 58, in any well known manner.

In our co-pending application, Serial No. 732,483, filed November 20, 1912, of which the present application is a division, there is described, illustrated and claimed a novel latching and locking arrangement which may be readily included in a switch employed with the present system, but it is not thought that further description of the means for securing the locking and latching functions is required in the present application.

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

What we claim is as follows:

1. In a system for supplying ignition to combustion or explosion engines, the combination with a plurality of ignition systems each comprising a source of current and circuit connections, one of said systems having a current interrupter included in its circuit connections, the construction of which tends to create electrical lag in said circuit; a timing mechanism including means to open and close respectively the said circuit connections of the different ignition systems independently at different relative times, the difference in the time of opening one of said circuit connections and the closing of the other of said circuit connections partly compensating for the electrical lag which occurs in one of said circuits.

2. In a system for supplying ignition to combustion or explosion engines, the combination with a plurality of ignition systems each having independent current sources; a set of circuit connections connected with each of said current sources; a timing mechanism including sets of contact elements electrically independent of each other; and a main operating member adapted to actuate said sets of contact elements to open and close the sets of circuit connections, one of said sets of contact elements being so positioned relative to the other that one of the sets of contact elements will be actuated previous to the other.

3. In an ignition system for combustion engines, the combination with a plurality of ignition systems each including electrically independent circuit connections; mechanisms operable to open and close said independent circuit connections of the ignition systems; one of said circuit connections having greater electrical lag than the other;

and engine actuated means adapted to operate the mechanism in the respective circuits at different time intervals to partly compensate at a critical speed for the said electrical lag in one of said circuit connections.

4. In an ignition system for combustion engines, the combination with a plurality of sparking circuits, each including devices operable to open and close said circuits; mechanism included in one of said circuits, whereby electrical lag is created therein; and a common timing mechanism operable relative to the devices for opening and closing the sparking circuits, to actuate the devices in the circuit including the greater lag, previous to the actuation of the devices in the other circuit.

5. In an ignition system for combustion engines, the combination with a plurality of independent sparking circuits; an electrically independent set of contacts included in each of said sparking circuits; engine actuated means interposed between the respective sets of contacts and adapted to actuate one of said sets of contacts previous to the actuation of the other set of contents.

6. In combination with a plurality of ignition systems having independent current sources; circuit connections connected with each of said sources of current; selective means for bringing either one or all of said systems into operation independently or concomitantly; mechanism included in one of said circuit connections, the construction of which tends to create electrical lag in said circuit connections; a set of contact elements included in each of said electrical connections; and an engine actuated timer so positioned that the contacts of the respective sets of circuit connections are disposed on opposite sides thereof, one of said sets of contacts being displaced relative to the engine timer cam, so that said set of contacts will be actuated to close the circuit connections of the greater electrical lag, previous to the actuation of the contact elements of the other set of circuit connections whereby the electrical lag in the said system will be partly compensated for at a critical speed, and a substantially synchronous sparking effect secured in each of said circuit connections at such times as all of the ignition systems are in concomitant use.

In testimony whereof we affix our signatures in the presence of two subscribing witnesses.

CHARLES F. KETTERING.
WILLIAM A. CHRYST.

Witnesses:

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O. D. MOWRY.