MEANS FOR LOCATING ENGINE TROUBLES

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By Attorney
This invention relates to a remote control for short circuiting spark plugs and means for locating troubles within internal combustion engines of the type equipped with spark plugs and used on automobiles, air-planes, tractors, marine engines, and the like.

The objects of the invention are to provide a trouble detector for internal combustion engines.

I accomplish the objects of my invention as shown in the accompanying drawings which form a part of this specification and in which similar letters of reference refer to similar parts throughout the various views.

Referring to the drawings, Fig. 1 is descriptive of the device and shows the hook up, Fig. 2 shows a sectional end view on the right-hand unit shown in Fig. 3, and of that portion of my device which in use is normally placed beneath the hood of an automobile or elsewhere.

Fig. 3 shows a sectional side view of that portion of my device shown in Fig. 2, two units only being shown, it being understood that any required number may be had. Fig. 4 shows a partial plan view of the switch unit and with which my device is equipped for the purpose of remote control. In use this switch is conveniently positioned at the steering wheel, or elsewhere.

Fig. 5 shows a sectional end view of said switch. Fig. 6 is a top plan view of the magnet.

Referring again to Fig. 1, T shows the battery used for ignition. M shows a spark coil. N shows the distributor, and S the spark plugs. These parts are all common on internal combustion engines with which my device is intended for use. My device can be made for any number of cylinders, but for illustration I use only two of the complete circuits, showing one in open position and one in closed position, open position meaning that the device is not in working position, and closed position meaning that my device is in working position. The wire B connects battery T with contact points B which are a part of the gang switch, this connection to the battery being connected on the same pole as the spark coil and distributor. P, another contact point of the switch, is not in contact with B while in open position therefore no current can pass through the switch. P is connected by means of the wire P to the coil P thus completing one side of the circuit to the coil P. The other side of the circuit follows wire C direct to the other side of the plurality of coils including the coil P and at a point designated by K, a wire C is connected to the wire C and wire C is connected on the other end to the permanent magnet G of the horse-shoe type and through the bearings to the swing arm G which has a tail piece G which is acted upon by an electromagnet, the operation of which is controlled by the switch P (detail of the electromagnet explained later). It will be understood that the permanent magnet G functions when the unit is in any position by returning the arm G and its tail piece G to its normal open position shown in the left unit of Figure 3 when the current is disconnected. The object of this arm G is explained in the next circuit which is similar to the one just explained, except that it is shown in closed position. When the device is in open position, the operation of the spark plugs S is not interfered with. In the closed position wire B connects the battery T with a contact point B as explained previously. In this circuit, the switch is closed and contact point P is electrically connected to contact point B, thus allowing the current to flow through wire P to coil I, through the coil I to wire C, and back to the battery T. This causes the electromagnet to attract the tail piece G (see also Figure 3) and rotate the same in the bearings G and G towards the magnetized core H (Figure 3). G, being affixed to G, Figures 1 and 3, and pivoted on the same arm, will swing up into contact with D, in the position as shown by G, see also Figures 1 and 2.

The operation is as follows: When the switch B and P is open, current flows from the battery through the primary winding of the ignition coil M and back to the battery. Flow of current through the primary winding of the ignition coil M induces a high tension current in the secondary winding of the ignition coil M, which normally, or when the switches B and D are open, flows from the coil M through the distributor N, wires S, spark plugs S, to ground on the engine and so back to the coil which is grounded. When a switch B is closed and its coil P is energized to operate the armature G to close the electromagnet switch D, the spark plug is shorted out and the high tension or spark plug current flows from the coil M through the distributor wires S, wire P, switch D, wire C back to coil M. In the open position first above explained, it will be noted that arm G does not come in contact with contact point B and therefore wire P has no effect on the spark plugs S. All the circuits in my device are in a similar manner, and any number of spark plugs may be likewise short.
circulated by closing the switch which is on the line with said spark plugs. When dual ignition is used, contact with the two points D, Figure 2, is made simultaneously, so that an electrical connection may be made to each spark plug.

Figures 2, 3, 4, and 5, show more particularly the details of my device which embodies two parts, a switch box, and a unit box. The unit box which carries the main mechanism comprises the casing A, Figure 2, which has two exterior binding posts B and C, from which wires B1 and C1 connect my unit with the battery, wire B1 corresponding to B3 on the wiring diagram, which corresponds to the current to plate B3, and other parts similarly designated. From the binding post B a wire B3 (not shown in the wiring diagram) conveys the current to plate B3, Figures 4 and 5, on the switch. The plate B3 acts as one of the contact points of my switch and is so designed that one of a series of finger projections thereon projects under each button in the series of buttons. When the button is pressed, the respective finger thereunder contacts with another contact in the switch. The buttons designated as B4 and B5, Figure 5, operate the two sections shown. Button B3, shown in Figure 5, when pressed, forces a finger projection on plate B3 against a contact point in which is part of plate B3, and said plate, through wire I1, is electrically connected to the coil C, Figures 1 and 2. This closes the circuit, allowing the current to flow through the coil I to the wire C1, Figures 1 and 2, which connects with the binding post C, through wire C4 in Figure 3, and thence back to the battery by means of wire C5, Figures 1 and 2. The current passing through the coil I causes the core H1 which is within the insulated spool H to become magnetized, which attracts the tail piece G3 (see Figure 3) and forces the arm G, Figures 2 and 3, into contact with D. Wire C3, coming from the battery as heretofore explained, is always in contact with the artificial permanent magnet G2 within which is one of the pivot bearings for G and G2, and these parts being of electrically conductive material, when arm G contacts with D, the electric current passes from D to the battery, through the arm G to the bearing block in G2, through the wire C3, back to the battery as heretofore explained. The current travels from the spark plugs S, through the wire F, Figures 1 and 2, to the binding post E, Figure 2, and D is the contact part of said binding post, Figures 1 and 2.

The coils I and F are optionally made with an inner winding, designated by the character F. The core H5 comprises strips of wire, passing through the center of spool H. Any one of the coils I, with the corresponding core H5, when electrically connected with a source of energy, constitutes and functions as an electric magnet. G2 designates the second pivot point for the arm G. The arm G2 and tail piece G3, in Figure 3, are operated the same as arm G and finger G3, in Figure 2. The switch button B3, Figure 5, is shown not pressed in this case, and therefore the circuit is open. If, Figures 1 and 5, show the contact point with which plate B3 would register if pressure was applied to the button B3. Contact point I1, Figures 1 and 5, is attached to a plate I1, Figure 5, and is electrically connected to F, Figures 1 and 3, by means of the wire F3, Figures 1 and 3. The other end of the coil is connected to the binding post C, Figure 3, by the wire C5, thence to the battery by wire C1, Figures 1 and 2. D, Figures 1 and 3, shows the contact with which said magnets registers when current flows through the coil I. This coil I and wire C5, Figures 1 and 3, are electrically connected at K, Figures 1 and 2. C1, Figure 3, shows a wire which extends the full length of my unit, and with this wire, connections are made similar to those parts by K, Figures 1 and 2. Figure 3, shows a conduit used to shield the wires between switch and the other portion of my device. E and F2, Figure 3, show binding posts to which the wires F and F3, Figures 1 and 2, are connected, the said wires being also connected to the spark plugs. There are two contacts D, Figures 2, and two binding posts E2 to allow connection to a cylinder in which dual ignition is used. When single ignition is used, only one of these binding posts and contact points are required. J shows the casing of my switch, Figures 4 and 5. The number of buttons on said switch should correspond to the number of the coils or pairs of binding posts designated by the characters E and F2, Figure 3. L, in Figure 3, shows a hanger means by which my unit may be suspended in convenient position while in use, a similar hanging means on the opposite end of my device is provided.

Having thus described my invention, I claim as new and desire to secure by Letters Patent of the United States of America:

1. In a testing device, the combination with the spark plugs of an internal combustion engine, of a series of electromagnets including cores, permanent magnets mounted on the electromagnets, armatures carried by the permanent magnets, contacts associated with the plugs, and a switch device in circuit with the electromagnets for energizing and deenergizing the electromagnets to move the armatures into or out of engagement with said contacts.

2. In a testing device, the combination with the spark plugs of an internal combustion engine, of a series of electromagnets, permanent magnets connected with the electromagnets, connections between the electromagnets and plugs, armatures pivotedly connected with the permanent magnets, and a switch device in circuit with the electromagnets and connections and operable to control the circuit in energizing and disengaging the armatures to engage or disengage the contacts.

3. In a testing device, the combination with the spark plugs of an internal combustion engine, of electromagnets, permanent magnets mounted on the electromagnets, switch devices, contacts for the spark plugs, armatures pivotally connected to the permanent magnets, said armatures including tail pieces and arms, circuit wires connecting the electromagnets, and said switch devices to actuate the tail pieces of the armatures to move the arms thereof into or out of engagement with the contacts upon energizing or deenergizing the electromagnets through the medium of the switch device.

4. In a testing device, the combination with the spark plugs of an internal combustion engine, of a series of electromagnets, permanent magnets mounted on the electromagnets, armatures including tail pieces, means for pivoting the tail pieces to the permanent magnets, arms carried by the tail pieces, contacts connected to the spark plugs, switch devices and current conductors connecting the electromagnets and switch devices, whereby when the electromagnets are energized the said arms will en-
gage said contacts and short circuit the spark plugs.

5. A short circuiting device for testing spark plugs of an internal combustion engine, comprising a plurality of electromagnets, permanent magnets mounted on the electromagnets, armatures pivotally mounted between the poles of the permanent magnets, contacts adjacent the armatures, connections between said contacts and spark plugs, and electrical means in circuit with the electromagnets to energize or deenergize the electromagnets to move the armatures into or out of engagement with said contacts.

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