June 5, 1945. C. MESSERSCHMIDT 2,377,353

IGNITION APPARATUS

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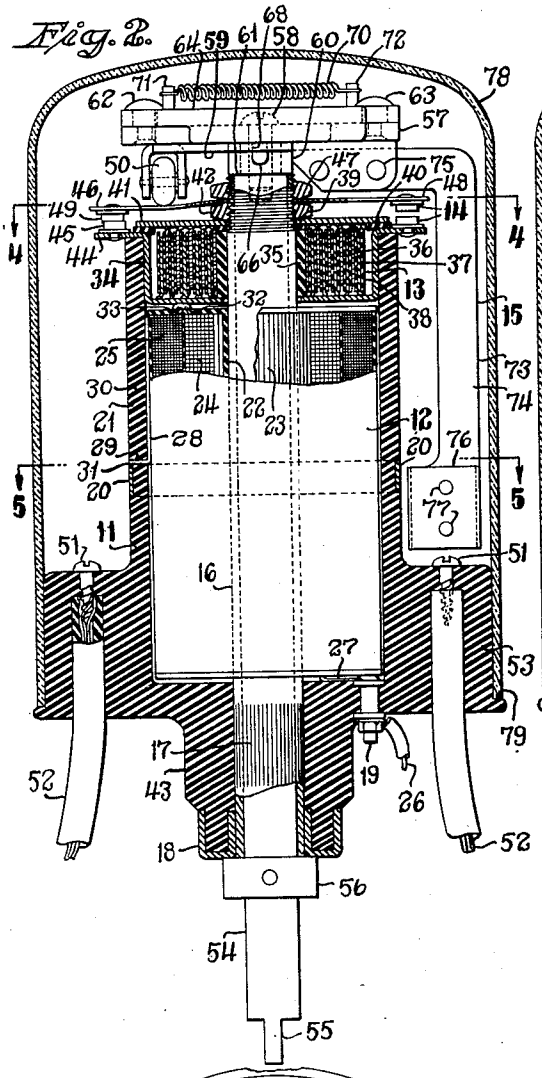

Fig. 2.

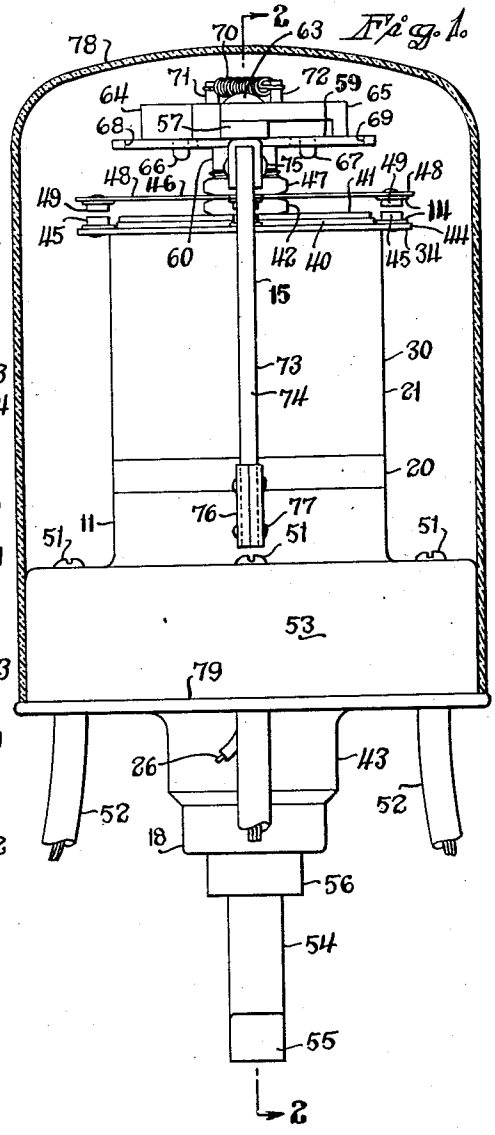

Fig. 1.

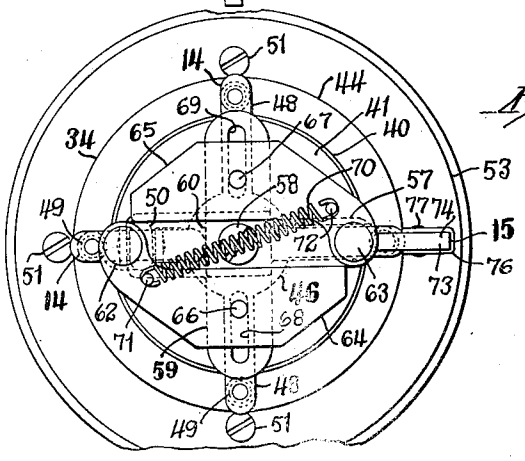

Fig. 3.

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Fig. 4.

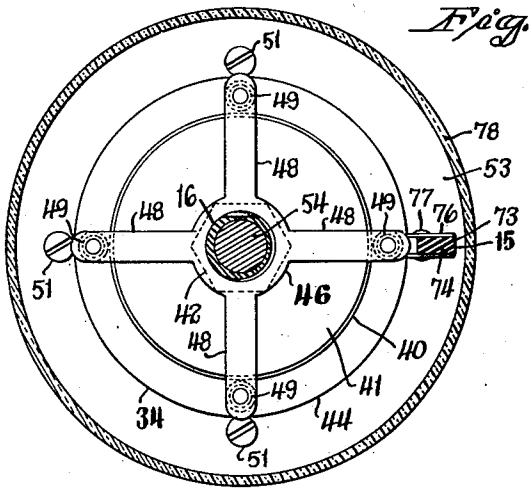


Fig. 6.

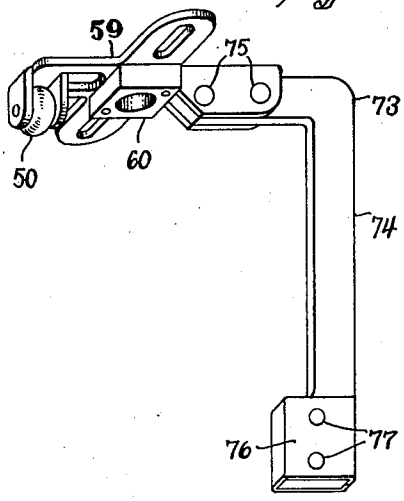


Fig. 5.

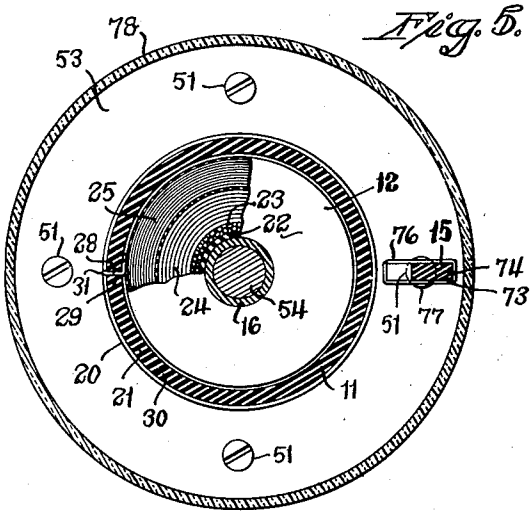


Fig. 8.

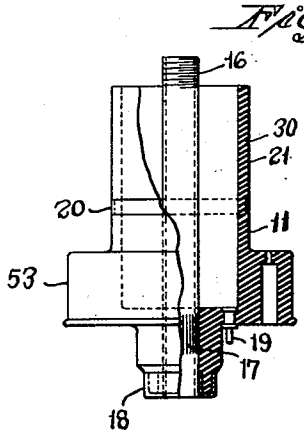
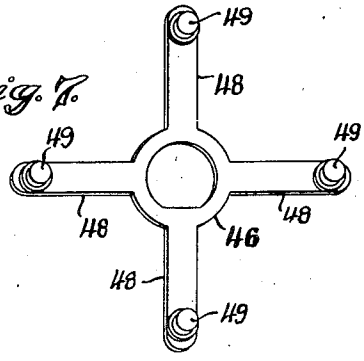


Fig. 7.



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Patented June 5, 1945

2,377,353

UNITED STATES PATENT OFFICE

2,377,353

IGNITION APPARATUS

Charles Messerschmidt, Westbrook, Conn.

Application August 25, 1943, Serial No. 499,938

11 Claims. (Cl. 123—148)

This invention relates to improvements in ignition apparatus, and more particularly to ignition apparatus for internal combustion engines.

One object of this invention is to provide an improved ignition apparatus of maximum simplicity and compactness.

Another object of this invention is to provide an ignition system of improved reliability of operation.

With the above and other objects in view, as will appear to those skilled in the art from the present disclosure, this invention includes all features in the said disclosure which are novel over the prior art.

In the description and claims, the various parts and steps are identified by specific names for convenience, but they are intended to be as generic in their application as the prior art will permit.

In the accompanying drawings forming part of the present disclosure, in which one way of carrying out the invention is shown for illustrative purposes:

Fig. 1 is a front elevational view illustrating one embodiment of ignition apparatus made in accordance with the present invention;

Fig. 2 is a sectional view on line 2—2 of Fig. 1;

Fig. 3 is a top plan view of Fig. 2, with the cover removed;

Fig. 4 is a sectional view on line 4—4 of Fig. 2;

Fig. 5 is a sectional view on line 5—5 of Fig. 2;

Fig. 6 is a perspective view of the distributor-arm and connected parts;

Fig. 7 is a perspective view of the flexible spring-member carrying the movable contacts; and

Fig. 8 is a front elevation partly in section of the hollow support or housing.

Referring to the drawings showing the particular form of the invention chosen for illustration therein, the ignition device or apparatus includes a hollow support 11 in which is mounted an induction coil 12 and a condenser 13. A circuit-breaker 14 and a distributor 15 are also carried by the support 11.

In order to make the hollow support 11, a tube 16 of self-lubricating bronze is provided with a knurled portion 17, and has a metal collar 18 fastened on its lower end in any suitable way as, for example, by a press fit or a shrink fit, and the tube 16 with its collar 18, and an electrical binding-post member 19 and a conductor-ring 20 are formed as inserts of a body-portion 21 of any suitable molded plastic insulating material such, for example, as Bakelite.

The induction coil 12 includes a spool 22 around the central tubular portion of which is arranged a magnetic core formed of soft iron wires 23, and includes a primary coil 24 and a secondary coil 25. A lead-in wire 26 from the battery (not shown) is connected to the binding-post 19, to which binding-post is also connected one end 27 of the wire of the primary coil 24. The outermost end 28 of the wire of the secondary coil 25 extends through a hole 29 through the annular wall 30 of the support 11 and is preferably soldered at 31 to the conductor-ring 20. Oil-proof cement is put into the hole 29 around the wire 28. The ends 32 and 33 of the wires of the primary and secondary coils are soldered to the bottom of the metal plate or cup-member 34.

The condenser 13 may be made by taking a tube 35 of hard fiber and winding thereon two strips of tin foil 36 and 37 with a piece of paper insulation 38 between them in a way well known to those skilled in the art, whereby the edge of the spiral piece of tin foil 36 extends up above the edge of the piece of paper 38, and the edge of the other spiral piece of tin foil 37 extends down below the other edge of the spiral piece of paper 38.

The wires 27, 28, 32 and 33 of the induction coil 12 are of sufficient length so that after they have been connected as described, the induction coil 12 and the plate or cup 34 can be lowered into the support or housing 11 to the position shown in Fig. 2. Insulating oil can then be poured into the housing until the induction coil becomes completely saturated and the oil rises above the bottom of the cup 34. The condenser 13 is then slid down into its position in the cup-member 34, whereupon more insulating oil is poured in until it covers the condenser 13. Soft annular gaskets 39 and 40 of soft vulcanized rubber, Neoprene, or other suitable material are placed in position and a metal cover-member 41 is clamped down tight against the gaskets 39 and 40 by means of a nut 42, thus crushing the opposite edges of the two spiral pieces of tin foil into respective closely-pressed engagement with the bottom of the metal cup 34 and with the metal plate or cover 41.

The lower hub-portion 43 of the support 11 is fixedly secured or supported in any suitable or usual way, and the collar 18 can serve as an electrical ground by having a suitable screw (not shown) clampingly engaging it in any suitable or usual way, to thus electrically connect the mechanism to the grounded terminal of the battery.

The metal cover 41 which is clamped by the nut 42 into close engagement with the tube 17, serves to electrically ground the cover-plate 41.

The cup-member 34 has an annular flange or extension 44 to which are secured four equally-spaced fixed contacts 45. A flexible spring-member 46 is held in non-rotatable clamped position against the nut 42 by means of a second nut or lock nut 47. The spring-member 46 has four flexible spring-arms 48, each of which has firmly secured thereto, a movable contact 49 adapted to engage a complemental one of the four fixed contacts 45. As shown at the right of Fig. 2, the complemental pairs of contacts 45 and 49 are normally spaced apart, and are made to contact only when the roller 50 presses and flexes a spring-arm 48 similar to the way shown at the left of Fig. 2. By having a plurality of pairs of circuit-breaker contacts actuated by one roller or cam, instead of having only a single pair of contacts actuated by the same number of spaced-apart cams as there are cylinders in the engine, the contacts last much longer.

Four high-tension or secondary distributor binding-post contacts 51, which may be in the form of screws screwed into contact with the wire of the high-tension or secondary electric cables 52 leading to the spark plugs (not shown) of the engine, are located a suitable distance away from the conductor-ring 20 so that the high-tension spark cannot pass from the conductor-ring 20 directly to the high-tension contacts 51. It will be noted that the high-tension cables 52 lead downwardly away from the underside of the flange or support-means 53, thus preventing water from traveling along the cables 52 to the contacts 51.

A shaft 54 is power-driven in timed relation to the engine in any usual or suitable way as, for example, by means of the end-key 55. A collar 56 is firmly secured to the shaft 54 in any suitable way.

A bar 57 is firmly clamped in rigid engagement with the upper end of the shaft 54 by any suitable means as, for example, the screw 58. The roller 50 of vulcanized fiber, Bakelite or other suitable insulation material is pivotally mounted in a plate 59, preferably a sheet-metal stamping, to which is secured a bearing-portion 60. The parts 59 and 60 have a free fit on the upper end of the shaft 54, the part 60 resting upon an annular shoulder 61 of the shaft 54.

The opposite ends of the bar 57 are pivoted by means of rivets 62 and 63 respectively to weighted arms 64 and 65 which respectively carry pins 66 and 67 which respectively slide in the slots 68 and 69. A coil-spring 70, under tension between pins 71 and 72 respectively secured to the weighted arms 64 and 65, serves to hold the parts in the position best shown in Fig. 3. The distributor-arm 73 has its main portion 74 formed of electrical insulation material such, for example, as Bakelite-impregnated cloth construction and has one end thereof secured as by rivets 75 or otherwise to one end of the plate-member 59, and the other end has a metal conductor-plate 76 enclosing its lower end and secured thereto by rivets 77 or other suitable means.

A cup-shaped cover-member 78, preferably of transparent material such, for example, as Lucite, covers the entire mechanism and rests upon an annular ledge or flange 79 of the support-means or flange 53 of the support 11.

In the particular construction illustrated in the drawings, the ignition apparatus shown is suited for a four-cylinder engine. If it were to be used for any other number of cylinders, the number of the pairs of the breaker-contacts 45, 49 and the number of the distributor-contacts 51 would be the same in number as the number of the cylinders of the engine.

As the shaft 54 rotates, the roller 50 successively flexes and pushes down the flexible spring-arms 48 to successively bring the upper movable contacts 49 into engagement with the lower fixed contacts 45, and in this flexing action of the spring-arms 48, the roller 50 causes each contact 49 to have a rubbing action upon its complemental contact 45 to thereby constantly perfect the contact surfaces and maintain them in proper condition. When a given pair of contacts 49 and 45 are brought together, and when the metal member 76 of the distributor-arm 73 spans most of the space between the conductor-ring 20 and one of the distributor-terminals 51, a spark jumps across the ring 20 to the terminal 51 and thence through a cable 52 to a spark plug (not shown) to fire the explosive mixture in a cylinder of the engine.

The parts 57 to 72 constitute an automatic spark-advance mechanism, since as the speed of the engine increases and the speed of the shaft 54 correspondingly increases, the weighted arms 64 and 65 are caused to move apart against the action of the tension-spring 70 to cause the pins 66 and 67 to move out along the slots 68 and 69, to thus shift the rotative position of the plate 59 carrying the roller 50 and the distributor-arm 73, to thus cause the spark to be delivered to the engine at an earlier position of its rotation. The plate 59 serves as part of the automatic spark-advance device and also carries the circuit-breaker roller 50 and the distributor-arm 73.

My improved ignition device in which the hollow support or housing 11 has the induction coil 12 and condenser 13 therein and submerged in oil, and with the circuit-breaker 14 and distributor 15 mounted on the housing, presents a very compact construction requiring a minimum of outside wiring, and in which the induction coil and condenser are effectively protected by the oil. And the cup-member 34 which forms one terminal for the condenser 13, also carries the fixed contacts 45 of the circuit-breaker 14. And the contacts 49 and 45 of the circuit-breaker 14 and the conductor-ring 20, and terminals 51 and the arm 73 of the distributor, are all in plain view inside of the transparent cover 78, and yet are protected from dirt, grease, oil and water. Also, the high-tension cables or leads 52 to the engine extend downwardly away from the ignition apparatus, thus preventing water from traveling along the cables 52 to the ignition apparatus.

The invention may be carried out in other specific ways than those herein set forth without departing from the spirit and essential characteristics of the invention, and the present embodiments are, therefore, to be considered in all respects as illustrative and not restrictive, and all changes coming within the meaning and equivalency range of the appended claims are intended to be embraced therein.

I claim:

1. An ignition apparatus including: a hollow support; an induction coil in said support; a shaft rotatably mounted in said support; a circuit-breaker actuable by said shaft; a distributor including a rotatable distributor-arm carried by said shaft and having a distributor-conductor rotatable around the outside surface of said sup-

port; a conductor-ring connected to the secondary of said induction coil and extending around the outside of and carried by said support, and located adjacent the path of travel of said distributor-conductor; and spaced-apart conductor-terminals carried by said support and located adjacent the path of travel of said distributor-conductor.

2. An ignition apparatus including: a hollow support including support-means extending out from said support; an induction coil in said support; a shaft rotatably mounted in said support; a circuit-breaker actuable by said shaft; a distributor including a rotatable distributor-arm carried by said shaft and having a distributor-conductor rotatable around the outside surface of said support; a conductor-ring connected to the secondary of said induction coil and extending around the outside of and carried by said support, and located adjacent the path of travel of said distributor-conductor; spaced-apart conductor-terminals carried by said support-means and located adjacent the path of travel of said distributor-conductor; and a cover supported on said support-means and surrounding the path of travel of said distributor-arm.

3. An ignition apparatus including: a hollow support; an induction coil in said support; a condenser in said support and above said coil; a shaft rotatably mounted in said support and extending upward through said coil and beyond said condenser; a circuit-breaker and a distributor including rotatable parts carried by the upper-end portion of said shaft, and including non-rotatable parts on said support.

4. An ignition apparatus including; a hollow support; an induction coil in said support; a condenser in said support and above said coil; a body of oil in said support in which said induction coil and said condenser are immersed; a shaft rotatably mounted in said support and extending upward through said coil and beyond said condenser; a circuit-breaker and a distributor including rotatable parts carried by the upper-end portion of said shaft, and including non-rotatable parts on said support.

5. An ignition apparatus including: a support; a shaft rotatably mounted on said support; a circuit-breaker including a fixed contact mounted on said support, and a complemental movable contact carried by a flexible spring-member which is mounted on said support with said spring-member tending to hold said movable contact out of contact with said fixed contact; and actuating-means caused by said shaft to flex said spring-member substantially more than sufficient to move said movable contact into contact with said fixed contact so as to produce a rubbing action between said complemental contacts.

6. An ignition apparatus including: a hollow support; an induction coil in said support; a condenser in said support and above said coil; a contact-plate located between said coil and said condenser and forming one contact of said condenser and having an extension; a shaft rotatably mounted in said support and extending upward through said coil and beyond said condenser; a circuit-breaker including a fixed contact mounted on said extension and a complemental movable contact actuated by said shaft; and a distributor carried by said support.

7. An ignition apparatus including: a hollow support having an open upper end; an induction coil in said support; a condenser in said support and above said coil; a contact-plate located between said coil and said condenser and forming one contact of said condenser and having an extension; another contact-plate above said condenser and forming the other contact of said condenser and also serving to close said open upper end of said housing; a shaft rotatably mounted in said support and extending upward through said coil and beyond said condenser; a circuit-breaker including a fixed contact mounted on said extension and a complemental movable contact actuated by said shaft; and a distributor carried by said support.

8. An ignition apparatus including: a hollow support; a shaft rotatably mounted in said support; an induction coil in said support; a circuit-breaker and a distributor including rotatable parts carried by said shaft, and including non-rotatable parts on said support; and spark-advance means interposed between said shaft, and said rotatable circuit-breaker and distributor parts.

9. An ignition apparatus including: a hollow support; an induction coil in said support; a shaft rotatably mounted in said support; a circuit-breaker actuable by said shaft; a distributor including a rotatable distributor-arm carried by said shaft and having a distributor-conductor rotatable around the outside surface of said support; conductor-means connected to the secondary of said induction coil and having conductor-portions located around the outside of and carried by said support, and located adjacent the path of travel of said distributor-conductor; and spaced-apart conductor-terminals carried by said support and located adjacent the path of travel of said distributor-conductor.

10. An ignition apparatus including: a hollow support; a shaft rotatably mounted in said support; an induction coil in said support; a circuit-breaker and a distributor including rotatable parts carried by said shaft, and including non-rotatable parts on said support, and said rotatable circuit-breaker and distributor parts including an approximately L-shaped member having circuit-breaker means on one of its arms and having distributor-means on the other of its arms.

11. An ignition apparatus including: a hollow support; an induction coil in said support; a condenser in said support and above said coil; a shaft rotatably mounted in said support and extending upward through said coil and beyond said condenser; a circuit-breaker and a distributor including rotatable parts carried by the upper-end portion of said shaft, and including non-rotatable parts on said support; and spark-advance means interposed between said shaft, and said rotatable circuit-breaker and distributor parts.

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