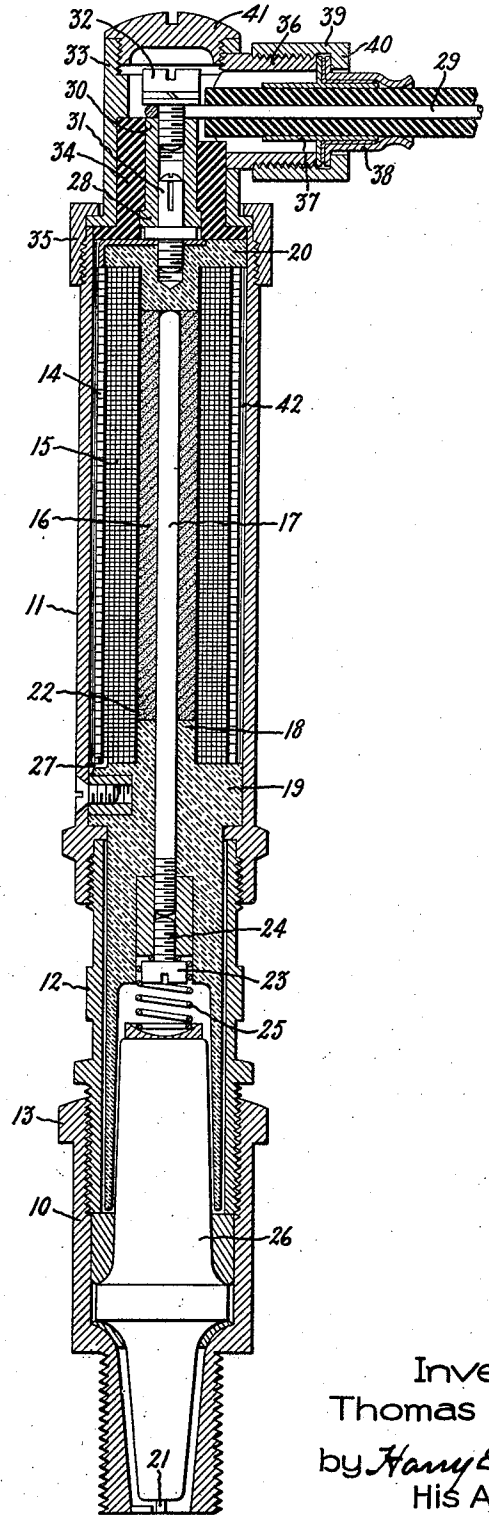
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IGNITION SYSTEM AND SPARK PLUG

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Inventor:
Thomas F. Robinson,
by Harry E. Dunham
His Attorney.

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IGNITION SYSTEM AND SPARK PLUG

Thomas F. Robinson, Kenilworth, England, assignor to General Electric Company, a corporation of New York

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8 Claims. (Cl. 123—148)

My invention relates to electric ignition systems and more particularly to spark plugs.

An object of my invention is to provide the electric ignition system with an improved spark plug which has particular application on aircraft.

Further objects and advantages of my invention will become apparent from the following description referring to the accompanying drawing, and the features of novelty which characterize my invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

In the drawing the single figure is a sectional side elevation of an ignition spark plug provided with my invention.

Referring to the drawing, I have illustrated a spark plug having a base member 10 and a tubular casing 11 which may be integral with the base member 10, or which may be connected to the base member by any suitable manner, such as by a connector 12. The connector 12 is a tubular member having threads at either end and makes connection with inside threads on the base member 10 and inside threads on the casing 11. The base member 10 has a conventional wrench co-operating portion 13 so that the spark plug base member may be screwed into the block of an internal combustion engine. Within the casing member 11, I provide a step-up transformer having a primary winding 14 and a secondary winding 15 of my improved construction.

With spark plugs which have particular application on aircraft, it is desirable that they be constructed so as to be reliable in operation. As aircraft are designed to fly at relatively high altitudes, it is important to design the electric ignition apparatus so as to prevent any flashovers to that part of the aircraft which is at ground potential. In order to accomplish this, I have provided a transformer which is within the spark plug casing and which has the primary or low voltage winding superposed upon the secondary or high voltage winding. With such a construction it will be seen, therefore, that there will be a much less likelihood of flashover between the transformer and the adjacent casing which is at ground potential than if the secondary or high tension winding were superposed upon the primary winding. The secondary winding is wound on a suitable core 16 which includes a laminated magnetic strip wound spirally on a metal center rod 17. The core member may also be constructed of powdered iron or cylindrical magnetic wire placed longitudinally or wound into a tape which is then wound on the center rod 17. The core member is held in an insulating bobbin by a spool body 18 and end checks 19 and 20. In order to keep the temperature of the transformer lower than the temperature of the internal combustion engine the end check 19 is made of any heat resisting material, such as a ceramic. So as to provide an electrical connection between the transformer and a center electrode 21, one end of the secondary winding 15 is connected to the core member and the center rod in any suitable manner, such as by soldering an end of the winding to the core member at 22, the center rod being in turn connected to the center terminal 21 by a connector 23. The connector may be of any suitable type and in the illustrated embodiment of my invention includes a bolt member 24 and a spring member 25. In order to further insulate the connector and rod members from the high temperature of the internal combustion engine a plug insulator 26 is provided between the connector and the end of the spark plug which is inserted in the internal combustion engine. The secondary winding consists of several layers of insulated wire which may be copper or other suitable low or medium resistance material. The layers are interspersed with a high temperature resisting insulating material. The end of the secondary winding electrically remote from the end which is connected to the core member at 22 is electrically connected to one end of the primary winding and to the casing 11 in any suitable manner, such as by a resilient connector 27 which is soldered to the adjacent ends of the primary and secondary windings. The other end of the primary winding is connected to a connector 28. The electrical connector 28 is in turn connected to a cable 29 which may be connected to any suitable source of potential which may be used to provide electric ignition for internal combustion engines, such as a magneto.

In order to connect one end of the primary winding to the cable the connector 28 includes a tubular member 30 having a shouldered rod member 31 secured in one end, which in turn abuts against the adjacent end of the primary winding. The opposite end of the tubular member 30 is internally threaded and is therefore adapted to receive a bolt member 32. The conductor of the cable 29 is thereby tightly held between the tubular member 30 and the co-operating bolt member 32. In order to close the connector end of the casing 11, I provide a clo-

sure member 33. The tubular member 30 is held within the closure member and electrically insulated therefrom by an insulating tubular member 34. This closure member has at one of its ends a shoulder which co-operates with a sleeve member 35. This sleeve member in turn is threaded to the outside of the end of the casing remote from the engine block so as to hold the closure member to the casing.

In order to provide an arrangement to allow entrance of the cable member into the closure member, I provide a pipe member 36 extending from the closure member through which the cable passes. Further, so as to tightly secure the cable member in the pipe 36, I provide tubular members 37 and 38 which have axially extending shoulders. The cable passes through the tubular members, and their shoulders abut against the end of the pipe 36 and are tightly held thereto by a sleeve member 39 which is threaded over the end of the pipe 36. This sleeve member 39 has an internal extending flange 40 for tightly clamping the shoulders of the members 37 and 38 to the end of the closure member.

In order to provide an arrangement so that the connector bolt 32 may be readily accessible, I provide a cap member 41 adjacent the head of the bolt which is removably secured to the closure member in any suitable manner, such as by co-operating threads.

So as to reduce eddy current and hysteresis losses in the transformer casing 11 a laminated shield 42 of high permeable magnetic material may be placed between the primary winding and the casing. Alternatively, by making the casing itself of suitable low loss material the laminated shield may be dispensed with.

In view of the foregoing, it will be seen that I have provided an ignition system for particular application on aircraft which dispenses with high voltage distributor leads. This is accomplished by providing an improved spark plug structure which has within an integral casing a transformer. So as to prevent any arcing-over between the transformer and ground I provide the low voltage winding adjacent the grounded casing. I further provide an improved connector arrangement between the primary winding and the cable which is supplied with the ignition current.

Modifications of the particular arrangements which I have disclosed embodying my invention will occur to those skilled in the art, so that I do not desire my invention to be limited to the particular arrangement set forth and I intend in the appended claims to cover all modifications which do not depart from the spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States, is:

1. A spark plug including a casing, an electrode, a low voltage primary winding, a relatively high voltage secondary winding, a core member, said secondary winding being superposed on said core member and having electrical connection therewith, and means for electrically connecting said core member with said electrode, said primary winding being superposed on said secondary winding and adjacent said casing.

2. A spark plug including a casing, an electrode having electrical connection with said casing, a center electrode, a low voltage primary winding, a relatively high voltage secondary winding, a core member, said secondary winding being superposed on said core member and having electrical connection therewith, and means for electrically connecting said core member with said center electrode, said primary winding being adjacent said casing and having electrical connection therewith.

3. An electric ignition system including a spark plug, a casing, an electrode having electrical connection with said casing, a center electrode, a low voltage primary winding, a relatively high voltage secondary winding, a core member, said secondary winding being superposed on said core member and having electrical connection with said primary winding and said core member, and means for electrically connecting said core member with said center electrode, said primary winding being adjacent said casing and having electrical connection with said casing.

4. A spark plug including a casing, an electrode, primary and secondary windings, a metallic rod member, a core member surrounding said rod member, said rod member having electrical connection with said secondary winding, and means for connecting said rod member with said electrode.

5. A spark plug including a casing, an electrode, primary and secondary windings, a metallic rod member, a core member surrounding said rod member, said rod member having electrical connection with said secondary winding, and means for connecting said rod member to said electrode, said secondary winding being superposed on said core member, said primary winding being superposed on said secondary winding and adjacent to said casing.

6. A spark plug including a tubular casing, spark plug electrodes, a transformer within said casing and having electrical connection with said electrodes, a closure member removably secured to the end of said casing remote from said electrodes and an electric connector within said casing and closure member and having a tubular member, said tubular member being connected at one end to said transformer and adapted to be connected at its other end to a source of power supply.

7. A spark plug including a tubular casing, spark plug electrodes, a transformer within said casing and having electrical connection with said electrodes, a closure member removably secured to the end of said casing remote from said electrodes, an electrical connector within said casing and closure member and having a tubular member, means for connecting one end of said tubular member to said transformer, means for removably connecting the other end of said tubular member to an electrical conductor, and a removable cap in said closure member adjacent said last mentioned means so that said last mentioned means is readily accessible.

8. A spark plug including a tubular casing, spark plug electrodes, a transformer within said casing and having electrical connection with said electrodes, a closure member removably secured to the end of said casing remote from said electrodes, an electrical connector within said casing and closure member, and a removable cap member in said closure member so constructed and arranged as to allow ready access to said electrical connector.

THOMAS F. ROBINSON.