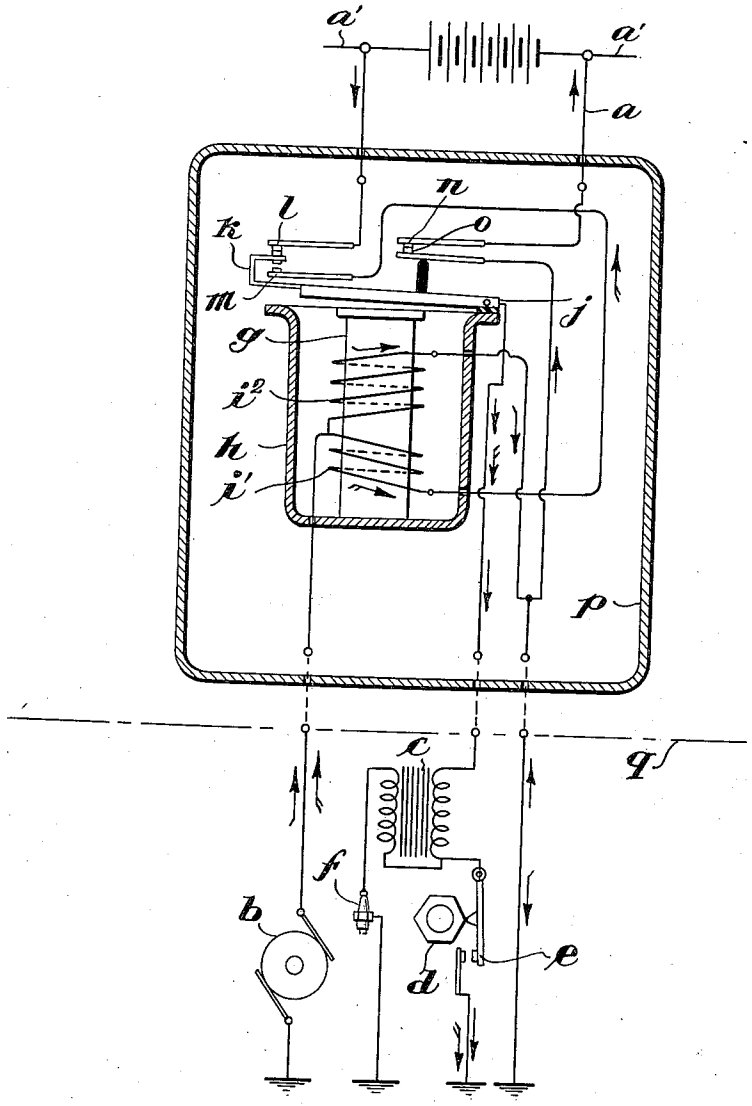
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SYSTEM OF IGNITION FOR INTERNAL COMBUSTION ENGINES FOR AIRCRAFT

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Inventor:
H. E. W. West
by Connolly Bros
Attys

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SYSTEM OF IGNITION FOR INTERNAL COMBUSTION ENGINES FOR AIRCRAFT

Harold Edward William West, Derby, England, assignor to Rolls-Royce Limited, Derby, England

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This invention is for an improved system of ignition for internal combustion engines for aircraft.

It is the practice to fit aircraft both commercial and military with a battery generator electrical system for the purposes of the wireless installation.

It has not been possible hitherto to use this battery to supply the current for the engine ignition owing to the electrical disturbance thereby occasioned and the ignition plugs are commonly, therefore, supplied with current from a magneto. The use of a magneto, however, has a number of disadvantages among which may be mentioned the necessity for using a hand starter magneto, that the driving mechanism must be of heavy construction to stand up to the torsional oscillations due to variations in driving torque, and that the magneto and contact breaker form together a comparatively large unit which it may be difficult to accommodate conveniently. Furthermore, it is not possible to provide a consistent electrical performance over a large range of advance and retard movement.

This invention has for its object to make use of this battery (or another battery) to avoid the disadvantages of a magneto while at the same time obviating the electrical disturbance which would be experienced if at material times the battery were supplying the ignition current.

According to this invention I provide a coil ignition system for an aircraft engine which comprises ignition plugs, a coil to supply current to the plugs, a distributor to distribute the current to the plugs, a battery which supplies current to the coil for starting purposes, an electrical generator (which does not supply current to the battery) which supplies current to the coil during the normal running of the engine and automatic means for connecting the generator to the coil and simultaneously disconnecting the battery from the coil and for disconnecting the generator from the coil and simultaneously connecting the battery.

It would not be possible to supply the ignition current from the generator which charges the battery and at the same time during normal running isolate the battery from the engine ignition system.

The change over may, of course, be arranged at any stage desired. I prefer only to use the battery while the engine is starting and idling dead slow.

Preferably the generator, which need only be small, operates a solenoid to operate in turn a switch which cuts off the battery from, and connects the generator to the coil as the engine accelerates from the state of slowly idling.

Preferably there is a second winding on the solenoid connected to the terminals of the generator through the generator terminal of the said switch and the said switch arm. This second winding (in series with the coil) will accordingly come into operation to hold the said arm in its position as soon as the solenoid has pulled the switch arm over and prevents the release of the switch arm once pulled over until the current supplied by the generator falls sufficiently following deceleration of the engine.

An example of the invention is illustrated in the accompanying diagram in which *a* is the battery, the leads which connect it to the rest of the battery generator system (not shown) being shown at a^1. *b* is the generator serving the engine ignition system, *c* the coil, *d* the contact breaker operating to break the contacts *e*, *f* the ignition plugs, *g* is the solenoid contained in a metal pot *h*, i^1 and i^2 the solenoid windings, *j* the switch arm carrying on an extension a contact *k* adapted to make contact with either one of the battery terminals *l* or a second contact *m* in accordance with the position of the switch arm *j*. The switch arm is also adapted when it comes down to break two other contacts *n* and *o* and so operate to disconnect the other terminal of the battery from the ignition circuit. *p* is a casing around the switches to form a screen against interference with the radio of the aircraft and at *q* is shown the fuselage or engine cowling.

The way the ignition system operates is as follows: When the engine is starting up or idling slowly the current passes from the battery around the circuit marked with arrows without a feather, that is to say through the contacts *l*, *k* along switch arm *j*, through coil *c* and contacts *e* back to earth and from earth through contacts *o*, *n* back to the battery.

When the engine passes from the idling position the generator will build up sufficient current in the shunt solenoid windings i^2 through a circuit shown by arrows having a single feather to pull down switch arm *j*, breaking contacts *l*, *k* and *n*, *o* and making the contacts *k*, *m*. The current will now flow from the generator through the circuit marked by arrows with two feathers through the series solenoid windings i^1, contacts *k*, *m*, switch arm *j*, coil *c* and back to earth through contacts *e* and current will accordingly be supplied to the coil from the generator until on the engine being decelerated the generator will fail

to provide sufficient current to hold down the switch arm *j* when the latter will return under the influence of a spring (not shown) to the position illustrated in the drawing and the battery will then supply current to the coil.

By providing two switches to cut off the battery it is ensured that no circuit is carried through the fuselage which is likely to avoid wireless interference effects due to the ignition to the system outside the fuselage.

It is necessary that the generator *b* should be of a type which does not generate increasing voltage with increasing speed beyond a certain well defined limit. This may be provided for in any one of a number of well known ways, for instance, the generator may be of the series winding type, three-brush armature reaction controlled type or of the permanent magneto field type or a vibrator field regulator control may be used.

Various advantages follow from using a generator energized coil. Distributor coil and generator can be accommodated separately wherever they can most conveniently be fitted in.

At maximum speed where the ignition coil voltage tends to fall off, due to the limited time interval for the current to build up in the primary winding, the generator will automatically provide current at a higher voltage and thus compensate for the normal current reduction. By careful adjustment it should be possible therefore to obtain an ignition spark of practically constant voltage and intensity throughout the whole speed range of the engine.

What I claim is:—

1. A coil ignition system for an aircraft engine which comprises plugs, a coil to supply current to the plugs, a battery which supplies current to the coil for starting purposes, an electrical ignition generator driven by the engine which is in circuit with and supplies current to the coil during the normal running of the engine and automatic electro-magnetic means dependent on the amount of current given by the generator for connecting the generator to the coil and simultaneously disconnecting the battery from the coil, and for disconnecting the generator from the coil and simultaneously connecting the battery, the circuit of the generator being wholly independent of connection with the battery.

2. A coil ignition system for an aircraft engine which comprises ignition plugs, a coil to supply current to the plugs, a battery which supplies current to the coil for ignition purposes, an electrical generator driven by the engine which is in circuit with and supplies current to the coil during normal running of the engine, automatic means for connecting the generator to the coil, a switch in such connections, a solenoid adapted to move the switch to cut off the battery from the coil and to cut in the said generator, a separate winding on such solenoid energized by the said generator and a winding in series with the coil also energized by the said generator which assists the former winding in holding the switch arm in the position to which it is moved as aforesaid as long as the generator is supplying sufficient current to the coil for the needs of the engine.

HAROLD EDWARD WILLIAM WEST.