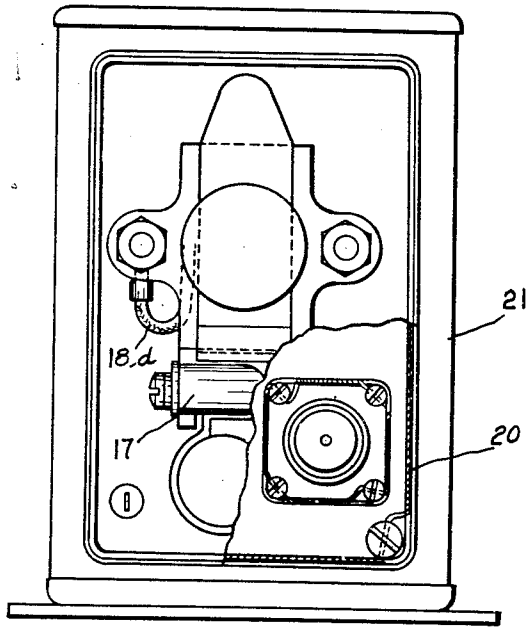
June 23, 1953 J. F. PUTNAM 2,643,284

IGNITION SYSTEM

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Fig. 6.



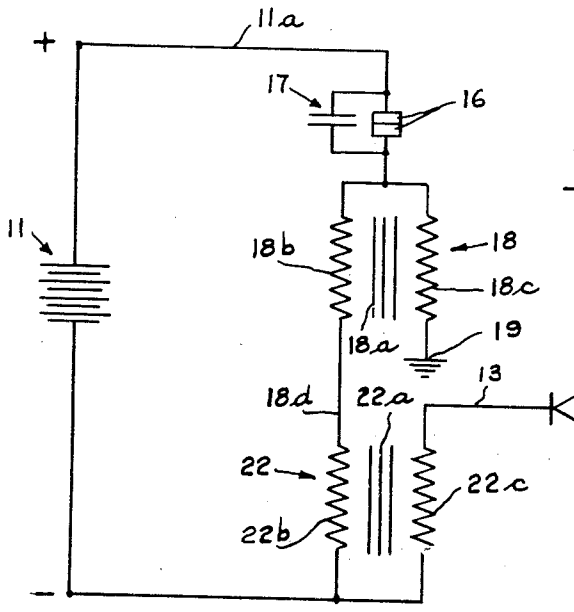


Fig. 1.

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IGNITION SYSTEM

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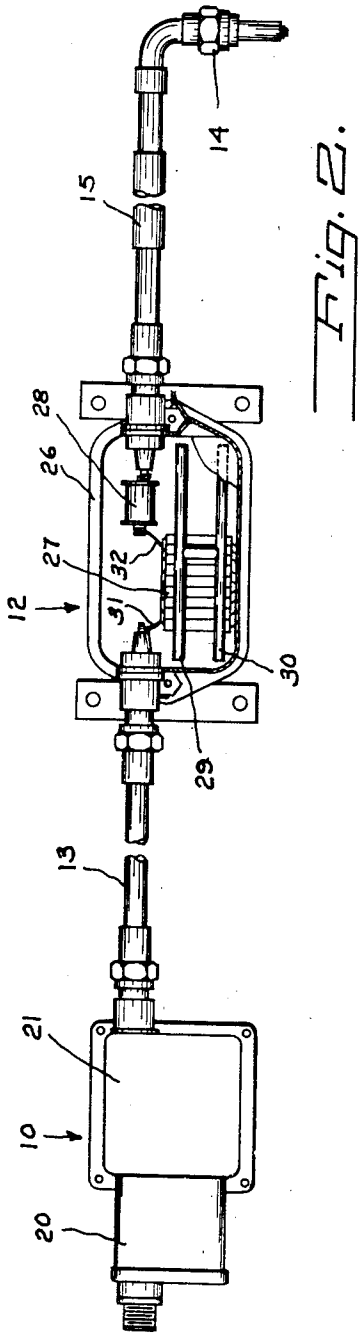


Fig. 2.

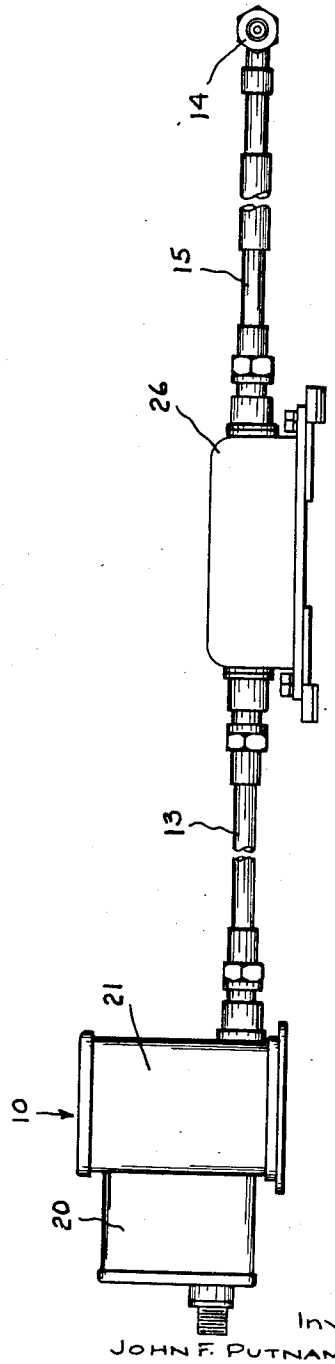


Fig. 3.

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IGNITION SYSTEM

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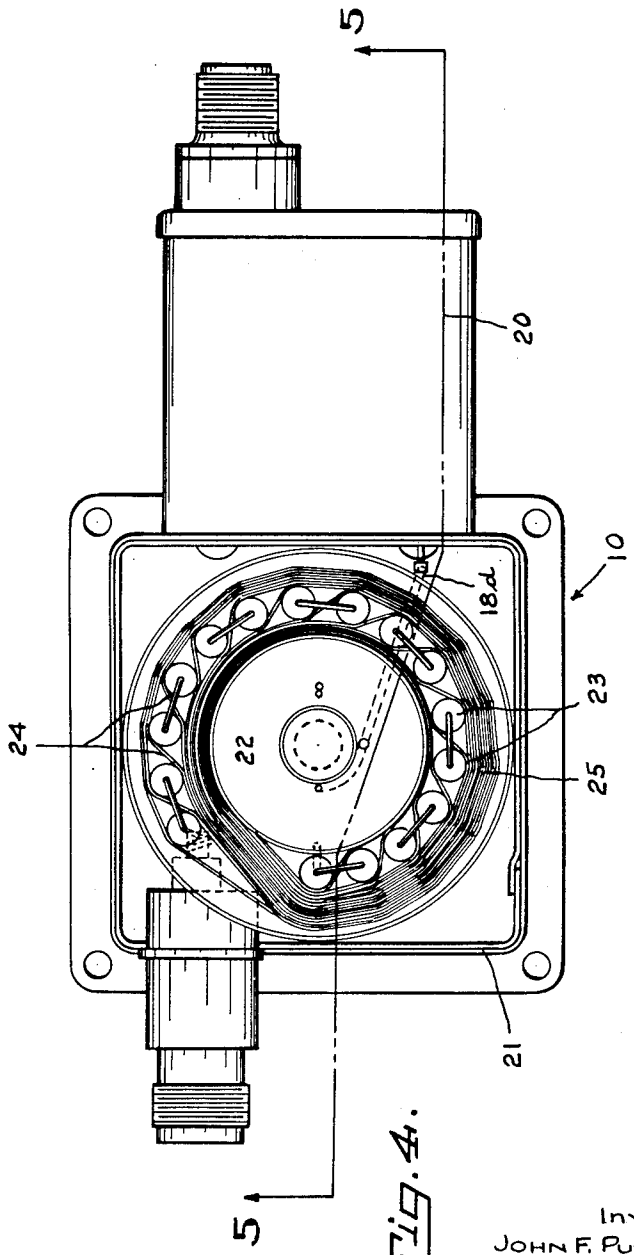


Fig. 4.

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IGNITION SYSTEM

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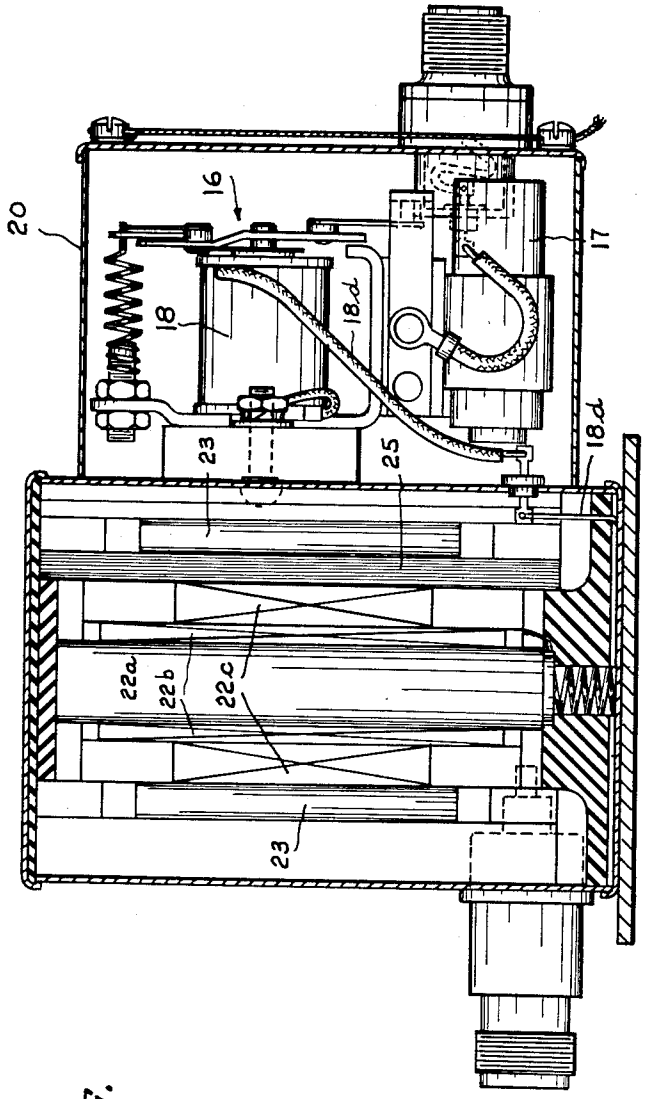


Fig. 5.

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Patented June 23, 1953

2,643,284

UNITED STATES PATENT OFFICE

2,643,284

IGNITION SYSTEM

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Application February 9, 1950, Serial No. 143,174

4 Claims. (Cl. 175—115)

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This invention relates to a new and improved ignition system for jet engines and has particular reference to such an ignition system which is relatively lightweight, simple and compact but yet provides high spark energy.

An object of the invention is to provide a new and improved ignition system for jet engines which system provides a condenser discharge type of ignition or spark, that is, a high energy, short duration discharge or spark for each individual discharge with a relatively high repetitive rate.

Another object of the invention is to provide such an ignition system wherein the coil and vibrator are positioned at a sufficient distance from the engine to avoid damage thereto by heat.

Another object is to provide a new and improved rectifying means and a new and improved method of assembling the same.

Other objects and advantages of the invention will be apparent from the following description taken in connection with the accompanying drawings. It will be understood that changes may be made in the details of construction and arrangement of parts shown and described, as the preferred form of the invention has been given by way of illustration only.

Referring to the drawings:

Fig. 1 is a schematic diagram of the ignition system of the invention;

Fig. 2 is a top or plan view of the ignition system assembly showing the condenser and gap assembly with the cover removed;

Fig. 3 is a side view of the assembly shown in Fig. 2;

Fig. 4 is a top or plan view of the coil and vibrator unit with the cover of the coil housing removed;

Fig. 5 is a sectional view taken on line 5—5 of Fig. 4, looking in the direction of the arrows; and

Fig. 6 is an end view of the vibrator in the coil and vibrator unit shown in Figs. 4 and 5.

Referring more particularly to the drawings wherein similar reference characters designate corresponding parts throughout, the invention consists broadly of an induction coil-vibrator assembly designated generally at 10, whose high voltage secondary output is rectified by a half-wave selenium rectifier stack and used to charge a high voltage capacitor. The capacitor is isolated from the ignitor plug by means of a series gap.

The induction coil-vibrator assembly 10 is adapted to be connected to a source of power such as battery 11 by lead 11*a*, and is also connected to the capacitor and gap unit 12 by lead 13, and

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said capacitor and gap unit 12 is connected to ignitor plug 14 by lead 15.

The induction coil-vibrator assembly 10 consists of a vibrator unit consisting of a pair of vibrator contacts 16, across which is the .3 mfd. condenser 17, and the compound wound vibrator coil 18 on laminated core 18*a*, and which contains both series winding 18*b* and shunt winding 18*c* which is grounded at 19 and which unit is in housing 20 which is attached to induction coil housing 21. The series winding 18*b* of coil 18 is connected to primary 22*b* of ignition coil by lead 18*d*.

The induction coil and rectifier unit consists of an ignition coil 22 on laminated core 22*a*, and said coil is connected to the vibrator and said coil comprises primary 22*b* and secondary 22*c* and is surrounded by a plurality of selenium rectifier stacks 23 connected in series and of sufficient number to provide a 10 kv. rectifier.

The rectifier stacks are insulated from each other by insulation 24 and are also insulated by insulation 25 and it will be noted that as shown in Fig. 4, the insulation 25 is graded and increases as the voltage increases in the system. The rectifier has an inverse peak rating of 50 k. v. p.

The capacitor or condenser assembly 12 is contained in housing 26 and consists of a .0025 mfd. energy discharge condenser 27 and sealed discharge series gap 28 with a break down voltage of from six to ten k. v. p. and which is connected to standard jet igniter plug 14 by lead 15. The condenser 27 consists of a plurality of sections mounted on glass rods 29 and 30 and is connected to lead 13 by lead 31 and to discharge gap 28 by lead 32.

The system is designed to operate from a 12 to 32 volts D. C. supply with an average current of 1.5 amperes at 24 volts.

It is pointed out that the system is designed for negative ground only.

The induction-coil vibrator and selenium rectifier are packaged separately from the capacitor and series gap for the following reasons:

1. The lead connecting the capacitor to the ignitor plug should not exceed three feet to retain the steep wave front of the voltage; and

2. The condenser and series gap are composed of glass and metal only so that high temperatures can be withstood by them, whereas the coil and selenium rectifiers should not be exposed to temperatures in excess of 180 degrees F.

The induction coil and selenium rectifiers are hermetically sealed in transformer oil and the condenser and gap are potted in suitable potting

compound for physical support and prevention of high altitude flash over.

The covers of the condenser and gap housing 26 and the vibrator housing 20 may be fastened on by screws or the like in order to allow easy removal for inspection. If total radio quietness is desired, these covers should be soldered to their respective housings and a filter placed in series with the battery supply.

All terminals except the battery input terminal may be coated with a suitable ignition sealing compound or grease to assist the terminal sealing for high altitude operation.

In operation, the vibrator acts as a means to interrupt the flow of current through the primary of the induction coil to produce high voltage impulses in the secondary of the coil, and to regulate the current to a fairly constant value over a wide range of battery voltages. The inherent current regulating feature of the vibrator assists in maintaining the output over a wide range of input battery voltage.

The output of the coil secondary is rectified to charge the capacitor to a high voltage. The capacitor is isolated from the ignitor plug by the series gap during the charging period as, otherwise, leakage across the ignitor plug might prevent the capacitor from being charged.

When the voltage across the capacitor is high enough to break down the series gap and igniter plug gap, a high energy spark is produced at the ignitor plug which discharges the capacitor, completing one cycle of operation.

The cycle is rapidly repeated and the repetition rate of this cycle of operation is dependent upon the battery voltage, being lower at low voltages.

The maximum sparking rate at 28 volts is approximately 6000 sparks per minute and at 10 volts the rate is approximately 1200 per minute, the rate being somewhat variable due to random voltage breakdowns of series gap and ignitor gap.

In the system described, the capacitor is designed to withstand charging and discharging to 25 k. v. p. Maximum energy available per pulse is approximately 300 mj. when the capacitor is discharging from 25 k. v. p. through the series gap.

From the foregoing it will be seen that new and improved means have been provided for obtaining all of the objects and advantages of the invention.

Having described the invention, what is claimed is:

1. In a device of the character described, a pair of attached housing portions, a vibrator in one of said housings and an ignition coil in the other of said housings, a rectifier in said housing for said ignition coil, said rectifier consisting of a plurality of stacks or sections in spaced relation surrounding said coil and connected in series and insulation for said stacks, said insulation being graded so that it increases as the voltage increases in the system.

2. In a device of the character described, a pair of attached housing portions, a vibrator in one of said housings and an ignition coil in the other of said housings, a rectifier in said housing for said ignition coil, said rectifier consisting of a plurality of selenium rectifier stacks or sections in spaced relation surrounding said coil and connected in series and insulation for said stacks, said insulation being graded so that it increases as the voltage increases in the system.

3. A coil and rectifier unit for ignition systems comprising, a housing, a coil in said housing, a plurality of rectifier stacks surrounding said coil, said rectifier stacks being connected in series, insulation for said stacks and insulating said stacks from each other, said insulation being graded and increasing as the voltage increases in the system, said housing being oil filled and hermetically sealed.

4. A coil and rectifier unit for ignition systems comprising, a housing, a coil in said housing, a plurality of spaced selenium rectifier stacks surrounding said coil, said rectifier stacks being connected in series, insulation for said stacks and insulating said stacks from each other, said insulation being graded and increasing as the voltage increases in the system, said housing being oil filled and hermetically sealed.

ELEANOR H. PUTNAM,
Administratrix of the estate of John F. Putman, deceased.

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