W. S. FROST.

ELECTROSTATIC MACHINE.

APPLICATION FILED MAR. 8, 1918.

1,283,492.

Patented Nov. 5, 1918.

2 SHEETS—SHEET 1.

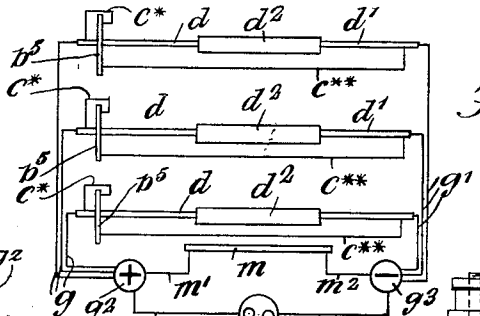


Fig. 8.

Fig. 1.

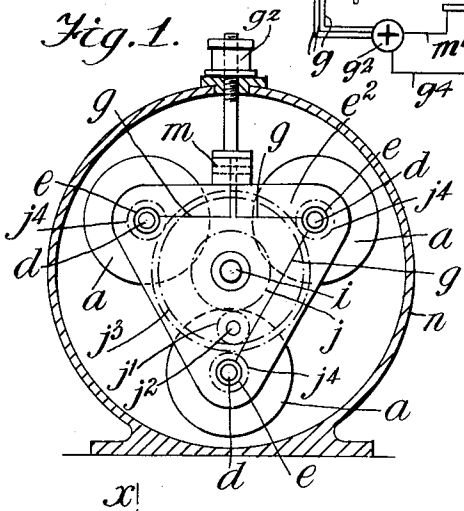
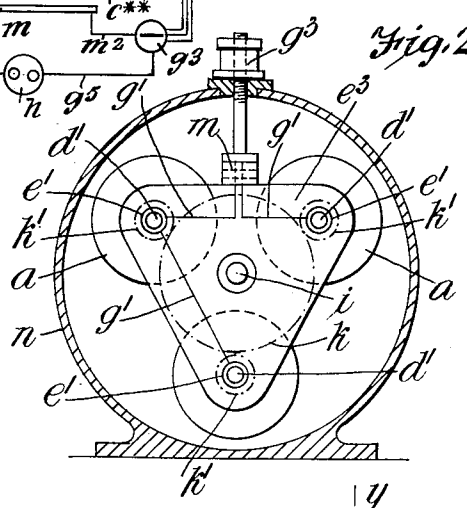


Fig. 2.



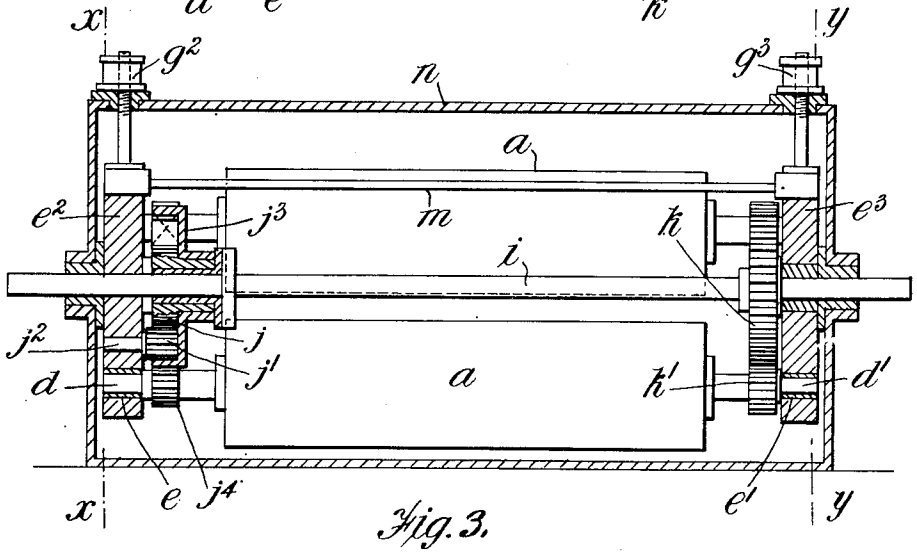


Fig. 3.

INVENTOR

WALTER SHELBURTON FROST

By [signature]

Attorney.

W. S. FROST.

ELECTROSTATIC MACHINE.

APPLICATION FILED MAR. 8, 1918.

1,283,492.

Patented Nov. 5, 1918.

2 SHEETS—SHEET 2.

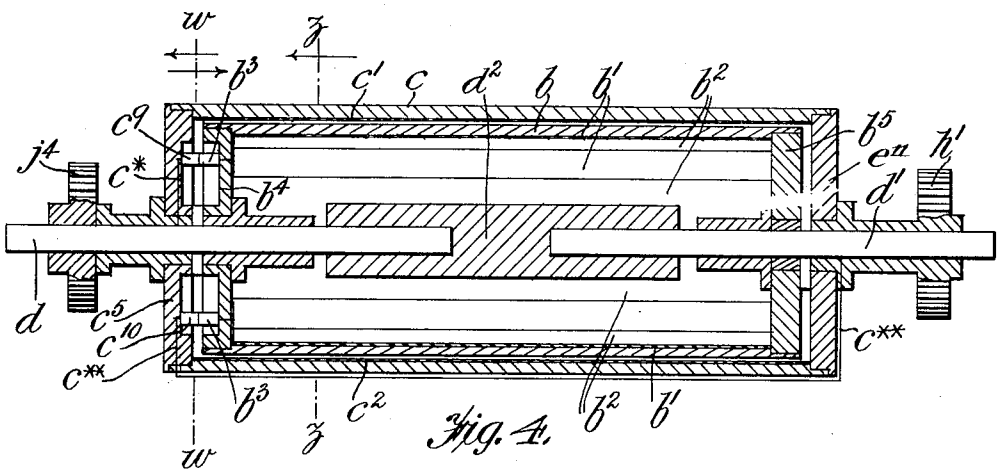


Fig. 4.

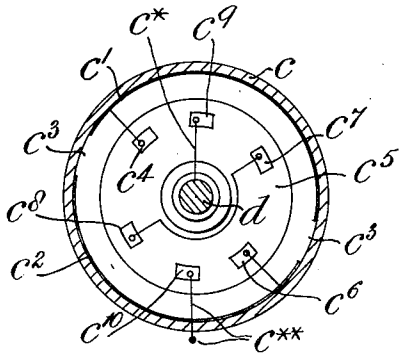


Fig. 5.

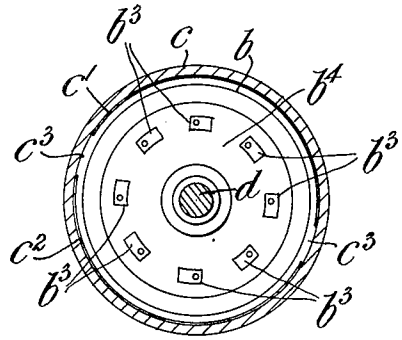


Fig. 6.

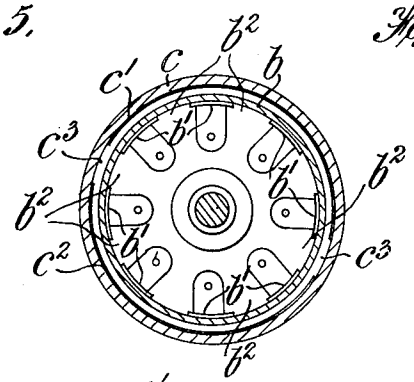


Fig. 7.

INVENTOR,

WALTER SHELBURTON FROST

By A. V. Wickham & Co

Attorney

UNITED STATES PATENT OFFICE.

WALTER SHELVERTON FROST, OF HOMERTON, LONDON, ENGLAND, ASSIGNOR TO THE ROTARY IGNITION SYNDICATE LIMITED, OF LONDON, ENGLAND.

ELECTROSTATIC MACHINE.

1,283,492. Specification of Letters Patent. Patented Nov. 5, 1918.

Application filed March 8, 1918. Serial No. 221,340.

To all whom it may concern:

Be it known that I, WALTER SHELVERTON FROST, a subject of the King of Great Britain and Ireland, and a resident of Homerton, county of London, England, have invented a certain new and useful Improvement in Electrostatic Machines, of which the following is a specification.

This invention relates to electro-static machines, particularly designed for use in the electrical ignition systems of gas, petrol and like internal combustion engines.

According to the present invention, a heavy compound (quantity) current giving a fat E. M. F. is produced by means of a compound induction machine, that is to say, said induction machine consists of two or more cylinder machines coupled or geared together in such manner that the said generators are simultaneously rotated, all the inner cylinders being rotated in one direction, viz:—clockwise, and all the outer cylinders in the opposite direction, viz:—anti-clockwise, thus increasing the number of contacting times, with consequent increase of current.

The invention also includes the manner of mounting the inner cylinder upon its shaft so that the ends thereof are insulated from one another, an intensifier, located in the casing of the machine but not forming part and parcel of the outer cylinder of a generator, and suitable electrical connections between the cylinders of the generator and its shaft.

For a clear understanding of the present invention, reference is to be had to the following description and accompanying sheets of drawings, in which:—

Figures 1 and 2 are sectional views on lines x, x and y, y, respectively of Fig. 3, which is a longitudinal section through the machine.

Fig. 4 is a longitudinal section through one of the generators, drawn to an enlarged scale.

Figs. 5 and 6 are transverse sections taken on line w, w of Fig. 4 and viewed in opposite directions.

Fig. 7 is a transverse section taken on line z, z of Fig. 4.

Fig. 8 is a diagrammatic view hereinafter referred to.

Like letters of reference indicate corresponding parts in the several figures.

In carrying out the invention, the electrostatic induction machine consists of two or more generators, preferably a compound of three—Figs. 1 to 3 in order to obtain a heavy and constant current, each generator being exactly alike and a duplicate of one another.

Each of these generators, indicated by a as a whole, in Figs. 1, 2, and 3, consists—as shown in Fig. 4—of an inner and hollow cylinder b and an outer and hollow cylinder c, closed at their ends in an air-tight manner and composed of a dielectric material, such as ebonite, the inner cylinder being free to rotate within the outer.

The outer cylinder c is provided upon its inner surface and longitudinally thereof with two heavy semi-circular field sectors c', c^2 each consisting of a thin plate of a high conductive material, such as silver, and separated and insulated from one another by the gaps c^3 formed by the material of the cylinder. Of these sectors, the sector c' serves as a positive inductive field and is connected with a contact or brush c^4—Fig. 5—on the inner face of the end c^5 of the cylinder c, while the sector c^2 serves as a negative inductive field, said sector c^2 being connected with a contact or brush c^6 also on the inner face of the end c^5 of said cylinder c.

The inner cylinder b is provided on its inner surface and longitudinally thereof with several (say six or eight) thin strips or sectors b'—Figs. 4 and 7—of a high conductive material, such as silver, as in the outer cylinder c, said strips or sectors b' being separate and insulated from one another by gaps b^2 formed by the material of said cylinder b, and these strips or sectors are each connected to a contact or brush b^3—Figs. 4 and 6—on the outer face of the end b^4 of the cylinder b. The inner cylinder b thus constructed constitutes the armature of the generator, with contacts or brushes adjacent the contacts or brushes of the fields of the outer cylinder.

The inner cylinder or armature b is fixed to but insulated from a longitudinal and centrally disposed shaft which is divided into two parts or sections d, d'—Fig. 4—insulated from one another and fixedly carried by an ebonite coupling d^2—Fig. 1—so that current cannot flow from one end of the shaft to the other end thereof.

The sections d, d' of said shaft extend beyond the ends of the cylinder b and form

bearings or supports upon which the outer cylinder c is free to rotate, and the ends of said extensions d, d' are rotatably mounted in bearings e, e'—Figs. 1, 2 and 3—mounted in plates or carriers e^2, e^3 formed of insulating material such as ebonite.

To collect or commutate the current, the inner face of the closed end c^5 of the outer cylinder c carrying the contacts or brushes c^4, c^6 of the field sectors c', c^2 is provided with two diametrically opposite contacts or brushes c^7, c^8—Fig. 5—coupled together, so that a bridge is formed between two opposite strips or sectors b' of the inner cylinder b, while two further contacts or brushes c^9, c^{10} serve, respectively, for the positive and negative poles of the generator, said contact c^9 having a lead c^*—Figs. 4 and 5—with metal-to-metal contact with the section d of the two-part shaft, while the other contact c^{10} has a lead c^{**}—Figs. 4 and 5—which may be brought to the exterior of the outer cylinder c, and which is connected with the other section d' of said two-part shaft.

In action, the inner and outer cylinders b and c are rotated in opposite directions, by any suitable gearing, and the current generated is conveyed from the positive and negative contacts c^9, c^{10} by the leads c^*, c^{**} to shaft ends d, d', their bearings e, e', and from there by leads g, g' to corresponding terminals g^2, g^3—Figs. 1, 2 and 8—to the sparking plug indicated as a whole by the reference letter h, through a distributer, not shown. A distributer is required in this system to time the firing of the charges in the cylinders as in the usual way. Any suitable form of distributer may be used, provided the insulation is of high dielectric material. The negative pole of the machine is by lead connected to each of the negative poles of each sparking plug of each cylinder, while the positive pole of the machine is connected to the rotary traverser of the distributer which electrifies each contact plate on passing over it, the number of contact plates corresponding with the number of cylinders to be fired. Each of the said contact plates is separately connected by leads to the positive pole of each sparking plug in such manner that upon the traverser electrifying the contact plate a spark is discharged in that cylinder, and so on in rotation to each cylinder of the engine.

As before stated, the generators are geared together so as to be simultaneously rotated, all the inner cylinders being rotated in one direction, viz:—clockwise, and all the outer cylinders in the opposite direction, viz:—anticlockwise.

For this purpose there may be employed—Figs. 1, 2 and 3—a centrally located shaft i rotatably mounted in the plates e^2, e^3. On one end of this shaft i is fixedly secured, but insulated therefrom, a gear wheel j which meshes with a pinion j' rotatably mounted on a stud j^2 carried by the end plate e^2. This pinion j' in turn meshes with the interior teeth of a gear wheel j^3 rotatably mounted on the boss of the gear wheel j, and said gear wheel j^3 by its external teeth meshes with the pinion j^4 fixedly mounted—Fig. 4—on the part d of the two-part shaft of each generator a, so that if the shaft i be rotated by any suitable means in clockwise direction pinions j^4 and consequently the inner cylinders b will all simultaneously rotate in the same direction.

On the other end of the shaft i is fixedly secured, but insulated therefrom, a gear wheel k, and this gear wheel k meshes with a pinion k' rotatably mounted—Fig. 4—on the part d' of the two-part shaft of each generator, and as each pinion k' is fixedly secured to the end c^{11} of each outer barrel c, rotation of the shaft i in clockwise direction will produce simultaneous rotation of all the outer barrels c in anti-clockwise direction.

The machine is provided with an intensifier m—Figs. 1, 2 and 3—which is carried by and between the end plates e^2, e^3, and said intensifier consists of two silver or other metal plates inclosed between plates of dielectric material, the one plate being connected by lead m' to the positive terminal g^2—Figs. 3 and 8—of the machine, and the other metal plate by lead m^2 to the negative terminal g^3 of the machine, and the whole machine is inclosed in a metal casing n—Figs. 1 and 3—in such manner that electric generation takes place under air-tight conditions.

Having now described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:—

1. An electro-static machine for automobile ignition systems including in combination, an exterior casing, a generator arranged within the casing, said generator consisting of a plurality of generator units each comprising an interior cylindrical armature member carrying a plurality of strips of high-conductive material having terminals exposed at one end of the cylinder, an exterior hollow cylindrical field member having positive and negative field plates of high-conductive material on the inner face thereof, terminal brushes carried by the outer cylinder and connecting with said field plates, positive and negative pole contacts also carried by said outer cylinder, a two-part shaft for supporting said armature and field members and having an intermediate insulating coupling, and electrical connections respectively between the separate shaft sections and the positive and negative contacts of the field member.

2. An electro-static machine for automobile ignition systems including in combination, an exterior casing, a main shaft ex-

tending centrally through the casing, insulating frame pieces carried by the shaft adjacent each end of the casing, an intensifier extending between said frame pieces and having exteriorly exposed terminals, a plurality of individual generator units journaled in the insulating frame pieces, gearing associated with said main shaft for operating the individual generator units, and electrical connections carried by the insulating frame pieces and connecting the several generator units with each other and with the intensifier.

3. An electro-static machine for automobile ignition systems including in combination, an exterior air-tight casing, a main shaft extending centrally through the casing, insulating frame pieces carried by the shaft adjacent each end of the housing, an intensifier extending between said frame pieces and having exteriorly exposed terminals, a plurality of individual generator units arranged within the housing and each consisting of a divided supporting shaft, a hollow cylindrical armature member of dielectric material and a plurality of longitudinal strips of high conductive material having brush terminals at one end of the cylinder, and a cylindrical field member also of dielectric material and having a pair of field plates of high conductive material insulated from each other on the inner face thereof to form positive and negative fields, a pair of electrically connected brushes carried by one end of the outer field member, said brushes being electrically connected to bridge a pair of opposite strips of high conductive material within the interior armature member, a second pair of brush members also carried by the said field member and respectively electrically connected with the positive and negative plates of the outer field member, and a third pair of brushes also carried by the outer field member and electrically connecting with the opposite ends of the divided shaft which supports said armature and field members, means for rotating the interior armature members in one direction, and means for rotating the exterior field members in the opposite direction.

In testimony whereof I have affixed my signature this 8th day of February, 1918.

WALTER SHELVERTON FROST.