

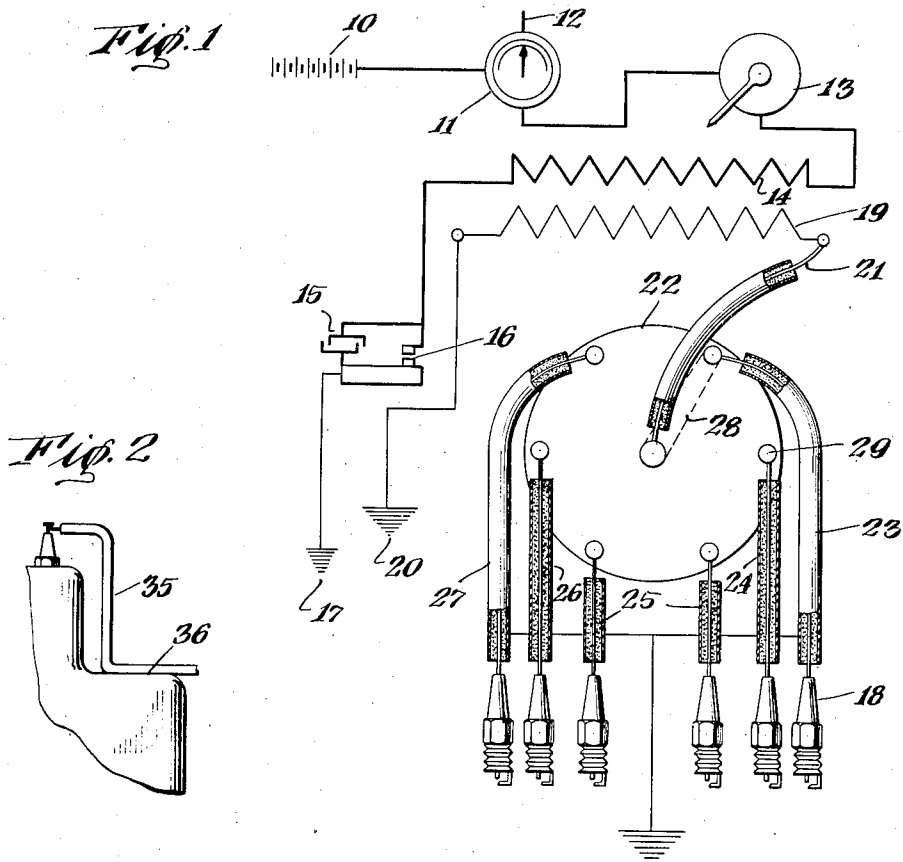
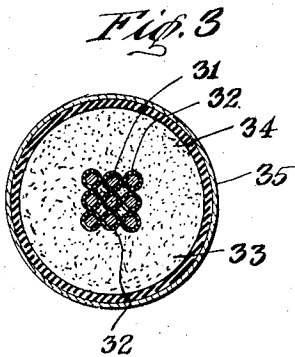
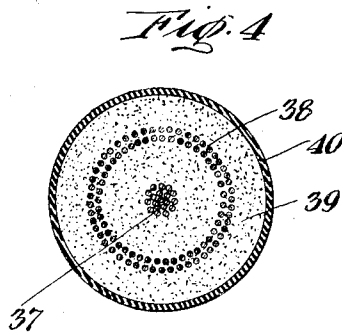
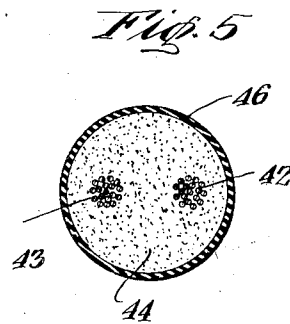
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CABLE FOR THE IGNITION SYSTEM OF INTERNAL COMBUSTION ENGINES

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CABLE FOR THE IGNITION SYSTEM OF INTERNAL COMBUSTION ENGINES

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Continuation of application Serial No. 445,363, April 18, 1930. This application June 4, 1931, Serial No. 542,041

1 Claim. (Cl. 123—148)

This invention relates to improvements in the leads or cables for the conveyance of high tension currents, particularly from the point of generation to the distributor, and from the distributor to the spark plugs, as for instance described in my application, Serial No. 445,363, filed April 18th, 1930, of which this is a continuation.

The object of this invention is to provide a duplex spark which bridges the gap of the spark-plug of an internal combustion engine.

In order to attain this end, the cable or conductor for conveying the high-potential current from its source to the arm or brush of the distributor, and from the segments of the distributor to the inner electrode of the various spark-plugs, is constructed in such a manner that the inner core consists of a number of insulated strands, the whole combination of which are embedded in suitable insulating material, said insulation surrounded by a flexible continuous metallic coating or return conductor, thus creating when the high potential current bridges the gap of the spark-plug a maximum of straight radial lines of dielectric force, and a maximum of dielectric equipotential lines of force in the form of concentric circles.

These lines of force are equal in number and in dielectric energy and represent an increased capacity of the conductors.

This increased capacity of the conductor or cable manifests itself in the following actions:

When high-potential current is conveyed to the spark-plug it will bridge the gap, and the resultant spark which I call the initial spark is an arc of a certain frequency. In the meanwhile during the flow of this high-potential current, a certain amount of energy has been stored up in this cable-arrangement resembling a condenser, and this stored up energy has to be released again. Since a path for this release is provided in the gap of the spark-plug, this discharge of stored up energy will take place right there in the form of oscillations of a higher frequency than those of the charging arc or the initial spark. We have thus two sparks: The initial spark, and the discharge spark which follows the first one.

The results attained with this arrangement are as follows:

The first spark (the initial one which has to take place under any consideration,) will ignite the mixture in the combustion chamber; and any remnant of combustible mixture left in said combustion chamber, will be fired by the succeeding spark, i. e. the discharge of the stored up energy.

Extensive tests and experimentation have proven that by this method which is not suppressive but creative in nature the following advantages can be gained:

- (1) The elimination of carbon deposits (unconsumed fuel).
- (2) A smooth, rythmical running of the motor.
- (3) A quick start under adverse weather conditions, such as extreme cold.
- (4) A quick pick-up when shifting from low gear into high.
- (5) With the proper adjustment of the fuel-supplying device a marked fuel-economy.
- (6) Longer life of the cables.

The cable described above can also be made in the form of two parallel stranded conductors, each strand being insulated, both conductors being embedded in suitable insulating material, or of two concentrically arranged conductors, having insulated strands, and the two conductors being embedded in suitable insulating material. In these combinations one conductor is used for conveying the current to the inner or insulated electrode of the spark-plug, and the other conductor being connected to the body or frame of the engine.

In the accompanying drawing, forming a material part of this disclosure:

Fig. 1 is a diagrammatic view of a jump spark ignition system for internal combustion engines embodying cables constructed according to my invention.

Fig. 2 shows a high tension current conveyor cable getting in contact with the engine body only while the engine is in motion.

Fig. 3 is a cross-section through a high tension current cable according to my invention.

Fig. 4 is a view similar to Figure 3, showing a modified form of cable.

Fig. 5 is a view similar to Figure 3, showing a further modification of the cable.

As illustrated, the primary or low tension circuit is composed of the battery 10, connected to an ammeter 11 in turn connected by a wire 12 to the generator, a switch 13, and the primary or low tension coil 14 connected to a condenser 15, and a vibrator 16 and grounded as at 17.

The secondary or high tension circuit includes the spark plugs 18, the secondary winding 19, grounded at 20, and connected by a cable 21 to a distributor 22 distributing or switching the secondary current to the various spark plugs 18 in the proper order of firing through the cables 23, 24, 25, 26, and 27, by means of a revolving arm

or rotor 28, touching in its revolution each of the stationary contacts 29.

As shown in Figure 3, the cables for conveying the high tension current, which may be flexible or rigid, flat or round, have an inner core composed of a plurality of metal strands 31 each surrounded by an insulating cover 32, and all embedded in a suitable insulating or dielectric material 33, surrounded by an insulating coating 34 of sufficient dielectric strength to prevent leakage.

The insulating coating 34 is surrounded by an outer metal or conducting covering 35 preferably connected to the body of the engine frame or grounded.

The metallic coating 35 can either be rigidly or flexibly attached to the insulating coating and may be loosely got into active metallic contact with the frame or body of the engine as illustrated at 36 in Figure 2, when the engine is in motion.

As illustrated in Figure 4, the modified form of cable has a core 37 composed of a plurality of bunched wire strands each surrounded by an insulating coating as described with the preferred form.

The core is surrounded by one or a plurality of concentrically arranged circles 38 of wire strands each surrounded also by an insulating coating as above described.

These concentric circles and the core are embedded in a body 39 of insulating material or dielectric medium.

The core, concentric circles and insulating material are surrounded by a coating 40 of rubber or similar insulating material.

In the modified form of my invention illustrated in Figure 5, the cable has two eccentrically arranged groups 42, 43, of strands bunched as shown, each of which is insulated as above described. All cables 31 (Fig. 3) 37, (Fig. 4) and 42, 43 (Fig. 5) are connected together at their terminal connections.

Both groups of bunched strands are embedded in a body 44 of insulating or dielectric material surrounded by a coating of rubber 46 or other insulating material.

The operation of my arrangement will be entirely clear from the above description by simultaneous reference to the drawing, and it will be evident that the high tension current from the induction coil to the brush of the distributor and from this point to the various spark plugs will be fed through cables, so constructed as to be in fact condensers, as they will become charged when the high tension current is conveyed to

the spark plugs and jumps across the gap of the latter in the same manner as a Leyden jar or condenser would become charged.

The firing of the mixture in the combustion chamber will take place, the moment the current jumps the gap of the plug. But after that I have a charge in this condenser like built cable; this charge must leak off, and the only point where it can leak off or discharge itself again is the gap of the spark plug.

This discharge of stored up current will be in the nature of high frequency oscillations. The actual and true existence of this spark can be proven and demonstrated by spacing or holding the terminal of the cable a suitable distance away from the respective spark-plug. We then can discern distinctly two sparks. The first one, the ordinary one which has to occur under any circumstances. This spark is pinkish in color, and then the eye will perceive the second spark which is bluish in color due to its higher frequency. These very same conditions will naturally exist at the terminals of spark-plugs inside the combustion chamber.

This secondary spark in the nature of a high-frequency discharge is actually created and the construction of the cable to conform with the scientific conception of a condenser or storing up medium of a current is the very feature of my invention.

It will be understood that I have described and shown the preferred forms of my invention only as some examples of the many possible ways to practically construct my invention, and that I may make such changes in the general arrangement and in the construction of the minor details as come within the scope of the appended claim without departure from the spirit of my invention and the principles involves.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

In an ignition system for internal combustion engines, a conductor for storing up energy in the moment of sparking comprising a shielded cable, an inner core for said cable composed of a plurality of individually insulated strands for increasing the metallic surface area of all strands to raise the active surface area of the combined number of strands, the entire cable constituting a condenser due to the large surface of the inner core and storing up energy in the moment the spark in the plug occurs, to leak off immediately through the gap of the plug.

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