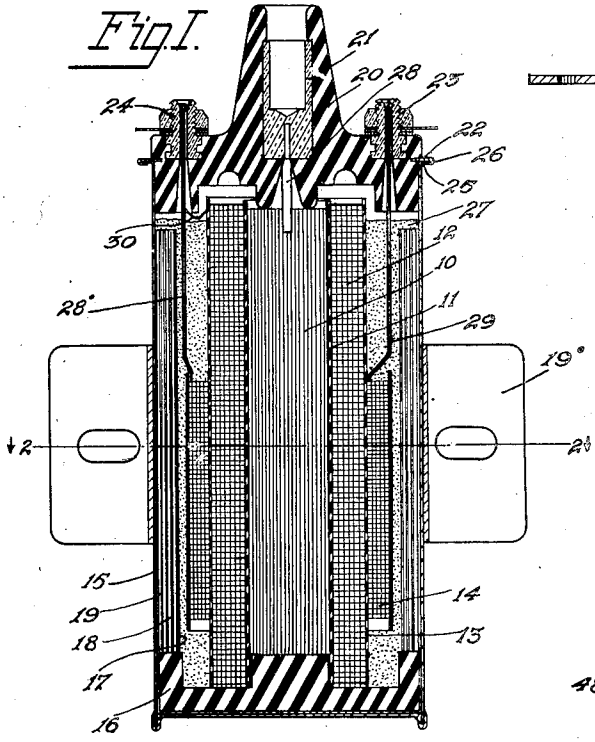
May 16, 1933. J. L. HOWIE 1,909,491

COIL

Filed Jan. 20, 1926

Fig. 1.



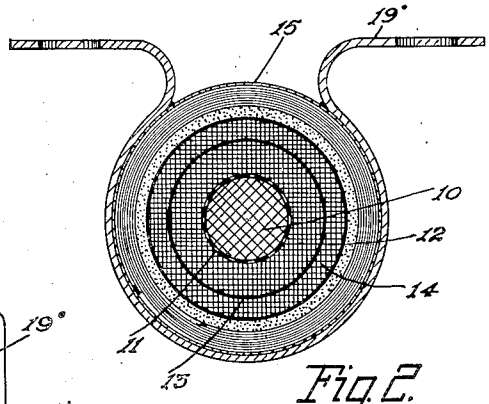
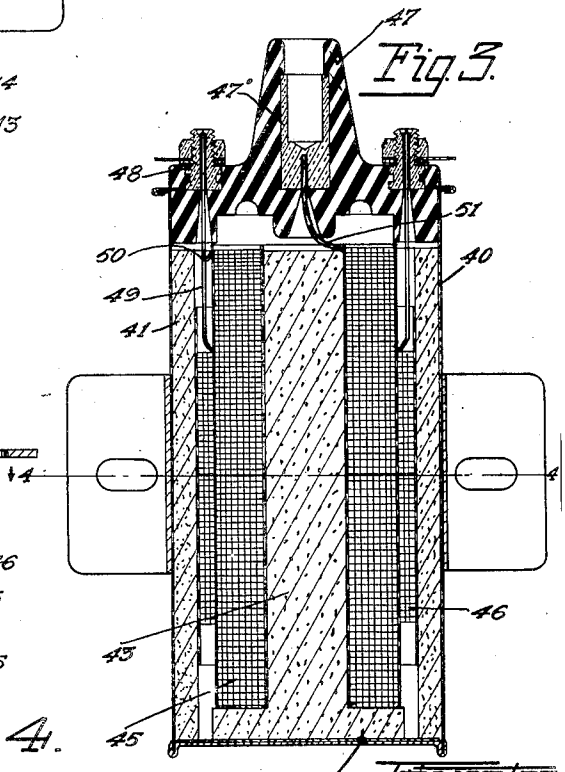


Fig. 2.

Fig. 3.



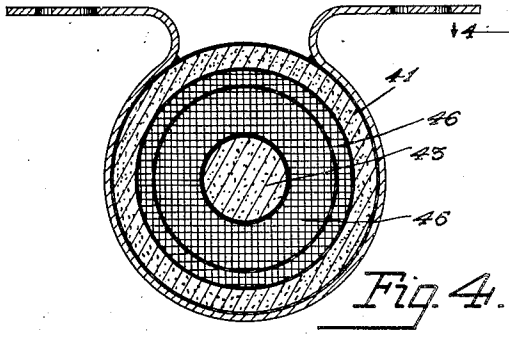


Fig. 4.

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UNITED STATES PATENT OFFICE

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COIL

Application filed January 20, 1926. Serial No. 82,445.

This invention relates to improvements in coils and particularly to improvements in spark coils, such as are employed in ignition systems of internal combustion engines.

The object of the invention is the provision of a spark coil which is cheap to manufacture, durable in construction, and by means of which a spark having a high degree of heat energy may be produced from a relatively low flow of current through the primary of the coil.

One of the features of the invention is the provision about the coils of a magnetic sleeve consisting of portions of magnetic material which are separated by insulating material.

Other features and advantages will appear from time to time as the description of the invention progresses.

It is believed the invention will be understood most readily from a detailed description thereof taken in connection with the accompanying drawing, in which:

Fig. 1 is a longitudinal section through one form of the coil;

Fig. 2 is a transverse section on the line 2—2 of Fig. 1;

Fig. 3 is a longitudinal section through a modified form of coil, and

Fig. 4 is a transverse section on the line 4—4 of Fig. 3.

Referring now to the drawing, in which like reference characters indicate the same parts in the several views; 10 indicates the core of the coil which may consist of a bundle of magnetic wires in the usual manner or may comprise a strip or sheet of steel rolled up on itself in a manner to be hereinafter described. The core 10 is surrounded by a layer of insulating material 11 upon which is wound the secondary winding 12 of the coil. Positioned outside of the coil 12 and separated therefrom by the layer 13 of insulating material is the primary coil 14.

The coil structure is placed in the usual container or can 15 of sheet metal. Within the bottom of the container 15 is a block 16 of insulating material so formed as to support the core 10, secondary winding 12 and the magnetic sleeve 17 which is positioned within the container 15 around the coil structure. In the form of the device shown in Figs. 1 and 2, the magnetic sleeve 17 comprises a strip or sheet 18 of steel or other magnetic material rolled up on itself to form a laminated cylinder. In forming the cylinder or sleeve 17 it has been found desirable to roll a sheet or sheets 19 of insulating material as paper between the successive layers or laminations of the sleeve 17 whereby the layers are insulated from each other; thus tending greatly to reduce the production of eddy currents. If desired the core 10 may be formed by rolling up a sheet of steel in a similar manner to produce a laminated core.

At 19′ is shown a clip or strip by means of which the coil container 15 may be secured to any suitable base or mounting plate. Projecting into the top of the can or container 15, above the coil structure, is the insulating cap 20 within which is moulded the high tension terminal 21 and the sealing strip 22. The low tension terminal 23 and the ground terminal 24 are also preferably moulded into the cap 20. The cap 20 is retained in position within the upper end of the container 15 by crimping the outer edge of the strip 22 downwardly under the outwardly projecting upper edge 25 of the container 15, as indicated at 26.

The coil structure is placed in the container 15 as just described and the space between the coil structure and the sleeve 17 is filled with melted sealing wax 27 or other suitable material which when cooled hardens and maintains the coil structure in the container 15 against displacement. At 28 is shown a pin of suitable conducting material one end of which extends into and makes electrical contact with the core 10, the other end being electrically joined to the high tension terminal 21. It should also be explained that one end of the secondary coil 12 is electrically joined to the core 10.

From an inspection of Fig. 1 of the drawing, it will be noted that one end of the primary coil 14 is joined by conductor 28′ to the ground terminal 24 while the other end of the coil is joined by conductor 29 to terminal 23. It will also be noted that one end

of the secondary coil 12 is connected to the ground terminal 24 through the medium of conductor 30, the other end being connected through core 10 and pin 28 to high tension terminal 21, as above described.

The present construction provides a magnetic shield which is easily manufactured, provides a magnetic path of very low resistance, and forms a rigid protecting cover about the coil structure; thus greatly reducing the danger of damage to the coil when subjected to hard usage. By winding the sheet metal into a cylinder, a magnetic shield is provided having a large amount of iron which greatly decreases the resistance of the magnetic path, and by insulating the layers from each other by means of paper or other means the tendency to produce eddy currents is greatly reduced. It is generally understood that the heat energy produced by a spark in the ignition system is dependent largely on the character of the magnetic path provided in connection with the coil. The present arrangement provides a magnetic path of very low resistance and therefore acts to produce a spark having a high degree of heat energy.

Reference will now be made to Figs. 3 and 4, which show a modified form of the invention. In this form the container or can 40 may correspond exactly with the container shown in Fig. 1. Within the container 40 is a magnetic sleeve or shield 41 formed of a compound of iron or steel filings and some insulating material, such as bakelite. When properly produced the iron may form as high as 90% by weight of the sleeve. As the individual particles of iron are largely separated by the insulating material by which they are bound together, the production of eddy currents within the magnetic material of the sleeve is reduced almost to a minimum. It will be noted that no insulating block is provided at the bottom of the container with the construction shown in Figs. 3 and 4.

The core 43 of the coil is formed of a compound similar to that of the magnetic sleeve 40 and is provided at the lower end thereof with the offset or laterally extending portion 44 which underlies and supports the secondary coil 45. Surrounding the coil 45 is the primary coil 46, the coils 45 and 46 being preferably insulated from the magnetic shield 41, core 43 and from each other by insulating material in the usual manner.

The insulating cap or cover 47 may be formed similarly to that disclosed in Fig. 1 and also may be retained within the upper end of the container 40 in the same manner. The primary coil 45 and the secondary coil 46 are joined to the ground terminal 48 by means of the conductors 49 and 50, respectively and the opposite end of the secondary coil 45 is joined to the high tension terminal 47' by means of the conductor 51. By forming the core 43 with the offset or laterally extending portion 44, the core is brought close to the magnetic sleeve 41 which tends greatly to reduce the resistance of the magnetic path.

It is to be understood that many modifications of the details of the invention are contemplated. The invention, therefore, should be limited only by the scope of the appended claims.

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

1. In a spark coil, a core, a primary and a secondary winding on said core, a sheet metal casing surrounding the entire structure and extending beyond the end of said core and windings, said casing being provided at its free end with an outwardly directed flange, a cover block for said casing one end of which is positioned within the extending portion of said casing, an annular sheet metal disc moulded in said block, the outer edge of said disc being crimped over said flange to secure said block to said casing.

2. In a spark coil, a core, a primary and a secondary winding on said core, a casing surrounding the entire structure and extending beyond the end of said core and windings, an outwardly extending flange at the end of said casing, a cover block of insulating material arranged with one end projecting into said casing, an annular disc of sheet material embedded therein, said disc being spun over to engage said flange.

In testimony whereof I have signed this specification.

JOHN L. HOWIE.