United States Patent [19]

Fry

[11] **3,731,246**

[45] **May 1, 1973**

[54] **IGNITION COILS**

[76] Inventor: **William Lawrence Fry**, Woollahra, Haughton, Staffordshire, England

[22] Filed: **Dec. 31, 1970**

[21] Appl. No.: **103,126**

[30] **Foreign Application Priority Data**

Dec. 3, 1970 Great Britain.....52,124/70

[52] **U.S. Cl.** **336/192,** 336/136, 336/208

[51] **Int. Cl.**.....**H01f 15/10**

[58] **Field of Search**.....336/192, 136, 221, 336/208, 198

[56] **References Cited**

UNITED STATES PATENTS

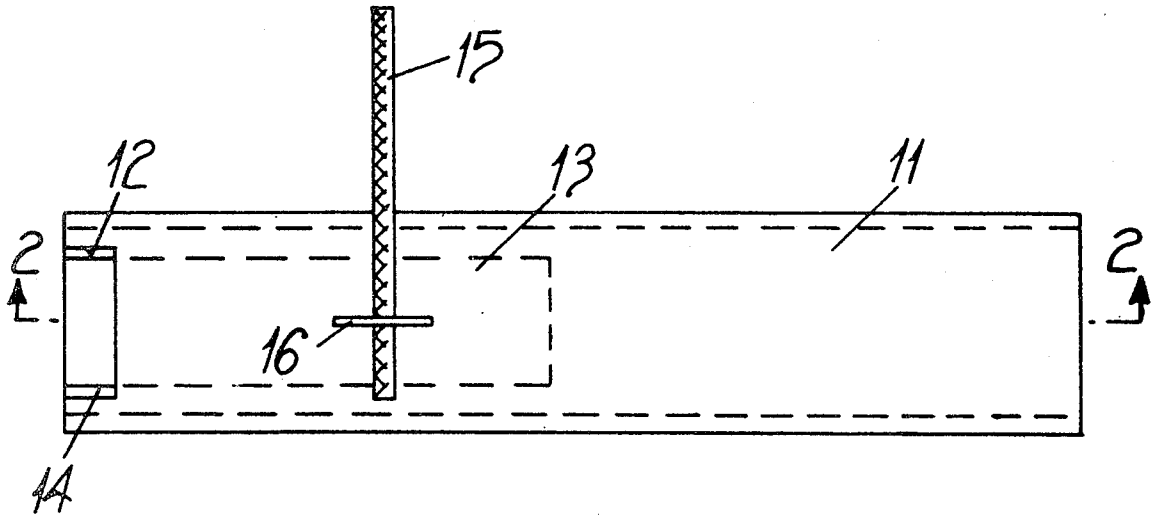
865,907	9/1907	Fodrey	336/192 X
1,142,027	6/1915	DaCosta	336/192
1,807,606	6/1931	Sickles	336/192
2,058,088	10/1936	Lewellyn	336/192 X
2,875,420	2/1959	Hofer	336/192
3,142,030	7/1964	Lenox	336/192 X
3,263,198	7/1966	Rothweiler	336/192
3,609,833	10/1971	Fry et al.	336/192

Primary Examiner—E. A. Goldberg
Attorney—Holman & Stern

[57] **ABSTRACT**

A method of manufacturing ignition coils, and a former assembly for use in such manufacture, the former assembly including a hollow insulating former having a first conductor positioned therein. One end of the first conductor projects at one end outwardly beyond the adjacent end surface of one end of the former, and a second electrical conductor is positioned on the outer surface of the former. The first and second conductors are electrically interconnected by means of a conductive fastening device which also secures the first and second conductors to the former. The method includes the step of manufacturing the assembly, and inserting a core into the former from said one end of the former so that the core engages the first conductor. A wire is connected to the second conductor, so that the wire is connected to the core through the first and second conductors and the fastening device. The wire is then wound on to the former to constitute a winding of the ignition coil.

5 Claims, 4 Drawing Figures



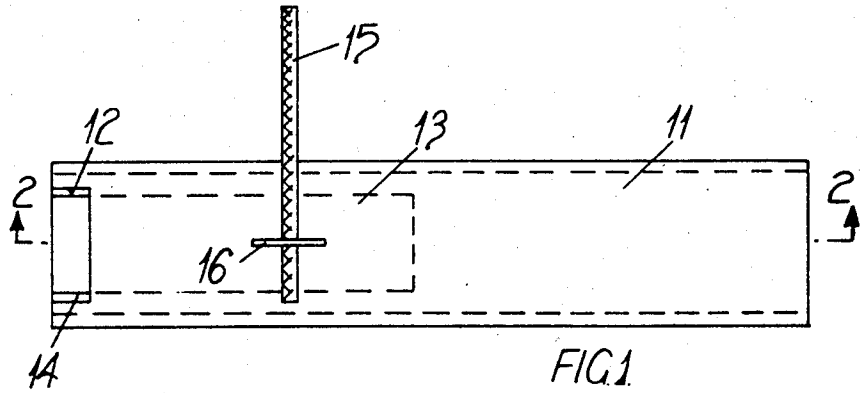


FIG. 1

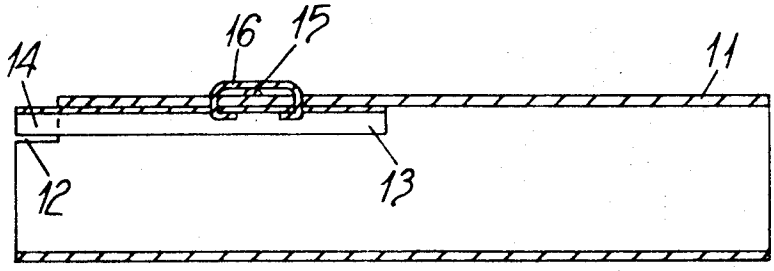


FIG. 2

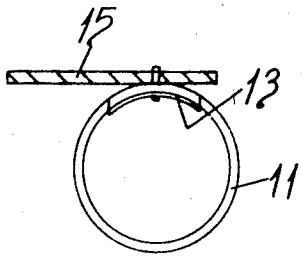


FIG. 3

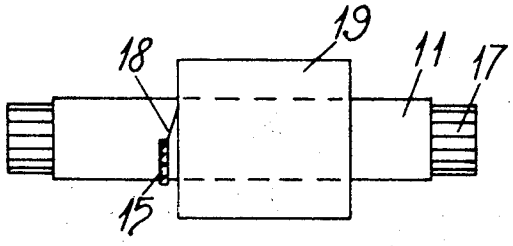


FIG. 4

INVENTOR
William Lawrence Fry
Holman & Stern
ATTORNEYS

IGNITION COILS

This invention relates to a method of manufacturing ignition coils, and to a former assembly for use in the manufacture of ignition coils.

A method according to the invention includes the steps of positioning a first electrical conductor on the inner surface of a hollow insulating former with one end of the first conductor projecting beyond the adjacent part of the end surface of one end of the former, positioning a second electrical conductor on the outer surface of the former, securing said first and second conductors to the former and electrically interconnecting the first and second conductors by means of an electrically conductive fastening device, inserting a core into said hollow former from said one end thereof, so that the core engages said first conductor electrically interconnecting an end of a wire and said second conductor, so that said wire and said core are electrically interconnected by way of the second conductor, the fastening device, and the first conductor, and winding said wire onto the former to constitute a winding of the ignition coil.

Preferably said first conductor is a length of conductive strip, said second conductor is a length of conductive braid, and said fastening means is a conductive, U-shaped staple, the limbs of said staple extending through the wall of the former and the strip and being deformed within the former to engage the strip, the portion of the staple interconnecting the limbs of the staple trapping the braid against the outer surface of the former, and said portion of the staple being disposed parallel to the axis of the former.

Preferably prior to insertion of the core into the former an operation is performed on the projecting portion of the first conductor to ensure that the projecting portion is displaced away from the axis of the former so that the end of the core does not engage said one of the first conductor during insertion of the core.

The invention further resides in a former assembly for use in the manufacture of an ignition coil, the assembly including a hollow insulating former, a first conductor within the former and projecting at one end outwardly beyond the adjacent end surface of one end of the former, a second electrical conductor positioned on the outer surface of the former and electrically conductive fastening means securing said first and second conductors to the former and electrically interconnecting said first and second conductors.

Desirably said one end of the former is provided with a slot open at said one end of the former and said end of said first conductor projects beyond the closed end of said slot.

One example of the invention is illustrated in the accompanying drawings wherein:

FIG. 1 is a side elevational view of a coil former assembly,

FIG. 2 is a sectional view on the line 2—2 in FIG. 1,

FIG. 3 is an end view of the former assembly shown in FIG. 1, and

FIG. 4 is a side elevational view of the coil former assembly during one stage in the manufacture of an ignition coil.

Referring to the drawings, a cylindrical tube of insulating material is cut to the required length to constitute a former 11 for the windings of an ignition coil. At one end the former 11 is provided with a rectangular, axially extending slot 12 one end of which is open at said one end of the former 11. A short length 13 of thin gage conductive strip is inserted into the former 11 from said one end so that it lies in contact with the inner wall of the former 11. One end of the strip 13 extends up to said one end of the former 11, and the strip 13 is positioned within the former 11, so that said free end of the strip 13 overlies the slot 12, the width of the slot 12 being slightly greater than the width of the strip 13. Thus a portion 14 of the strip 13 is aligned with the slot 12, and extends beyond the base of the slot 12. A length of copper braid 15 is then engaged with the outer wall of the former 11 so that a portion of the wall of the former 11 is sandwiched between the braid 15 and the conductive strip 13. A U-shaped conductive wire staple 16 is then used to secure the strip 13 and the braid 15 to the former 11, the two limbs of the U-shaped staple 16 passing through the wall of the former 11 and the strip 13 and being bent over to engage the strip 13 inside the former.

The portion of the staple 16 interconnecting the two limbs thereof engages, and traps the braid 15 in contact with the outer surface of the former 11. Thus, the wire staple 16 serves to secure the braid 15 and the conductive strip 13 in position on the former, and further serves to electrically interconnect the braid 15 and the conductive strip 13.

The conductive wire staple 16 is so positioned that the portion of the staple interconnecting the two limbs thereof extends parallel to the axis of the former 11, so that there is no need for the portion of the staple, which interconnects the two limbs thereof, to be curved to ensure that the braid 15 is trapped. The tool used to staple the braid 15 and the conductive strip 13 to the former 11 is of substantially conventional form, with the exception that the anvil against which the limbs of the staple 16 are forced to bend the limbs of the staple 16 is such that it can be inserted into the former 11.

A preformed conductive core 17 is to be inserted into the former 11, and is to be an interference fit within the former 11, so that the core makes electrical contact with the conductive strip 13. In order that during insertion of the core into the former the strip 13 is not damaged, the core is inserted into the former 11 from said one end of the former 11, and prior to insertion of the core into the former it is necessary to ensure that the portion 14 of the strip 13 is displaced away from the axis of the former 11, that is to say extends within, or through the slot 12. When the strip 13 is secured in position within the former 11, the natural resilience of the strip 13 may ensure that the portion 14 thereof does infact extend within, or through the slot 12. However, in the event that this does not occur, the portion 14 is subject to an operation, either manual or automatic, to displace the portion 14 of the strip 13 in the required manner.

The core is inserted into said one end of the former 11, and since the portion 14 of the strip 13 is displaced away from the axis of the former 11, then the core 17 will not engage the free end of the strip 13, and the risk of the strip 13 being damaged by insertion of the core will be minimized. The core is fully inserted into the former 11, so that the core 17 and the former 11 occu-

py their desired relative positions. One end of a wire **18** which is to form the secondary winding **19** of the ignition coil is then electrically connected to the copper braid **15**, and is then wound onto the former **11** to constitute the secondary winding of the coil. Thus, the secondary winding of the coil is electrically connected at one end to the coil of the coil through the braid **15**, the staple **16**, and the strip **13**, it being appreciated that the core **17** makes contact with the strip **13** within the former **11**. The primary winding of the ignition coil is then wound on top of the secondary winding.

Adjacent layers of the secondary winding and the primary winding, and the secondary and primary windings are separated from one another in the usual manner, by layers of insulating paper. Moreover, the wire used to form the secondary and primary windings has a coating of insulating varnish, which ensures that adjacent convolutions of the winding are insulated from one another.

The assembly comprising the core, the former and the windings is then inserted into a conventional ignition coil casing and the appropriate electrical connections are made between the primary and secondary windings and terminals on the casing, and between the core and the high tension output terminal on the casing.

It will be appreciated that if desired the windings can be wound onto the former **11**, prior to insertion of the core **17** into the former **11**, although it is preferred to insert the core into the former **11** prior to forming the windings on the former.

As an additional aid to securing the strip **13** in position, an adhesive can be applied between the strip **13** and the former **11**.

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

1. A former assembly for use in the manufacture of an ignition coil, the assembly including a hollow insulating former, a first conductor within the former and projecting at one end outwardly beyond the adjacent end surface of one end of the former, a second electrical conductor positioned on the outer surface of the former and electrically conductive fastening means securing said first and second conductors to the former and electrically interconnecting said first and second conductors, wherein the former is provided with a slot open at said one end of the former, and wherein said one end of the first conductor projects beyond the closed end of said slot.

2. An assembly as claimed in claim **1** wherein the first conductor is a length of conductive strip.

3. An assembly as claimed in claim **1** wherein said second conductor is a length of conductive braid.

4. An assembly as claimed in claim **1** wherein said fastening device is a conductive U-shaped staple the limbs of which extend through the wall of the former.

5. An assembly as claimed in claim **4** wherein the portion of the U-shaped staple which interconnects the limbs of the staple is disposed parallel to the axis of the former.

* * * * *