

Jan. 19, 1937.

D. C. THORDARSON

2,068,522

IGNITION TRANSFORMER

Filed Nov. 29, 1933

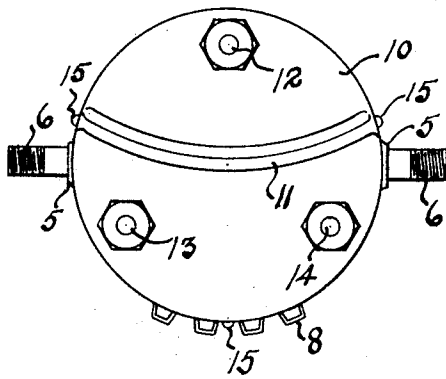


Fig. 1.

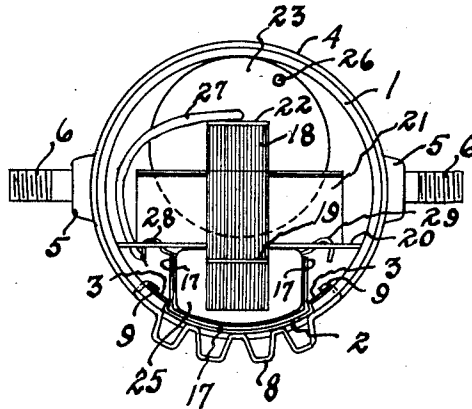


Fig. 3.

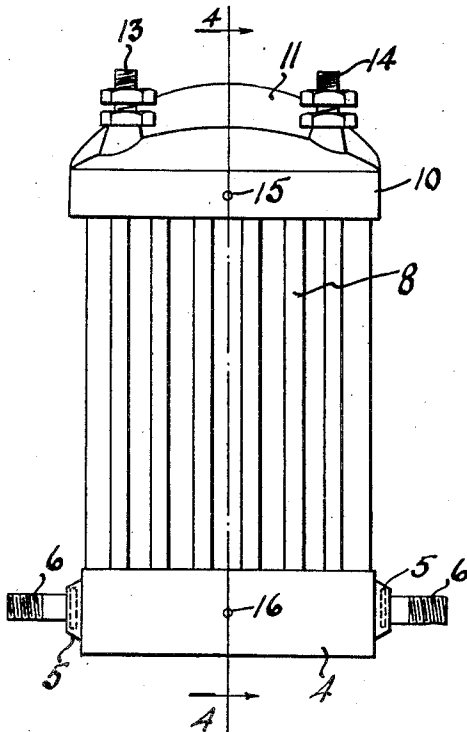


Fig. 2.

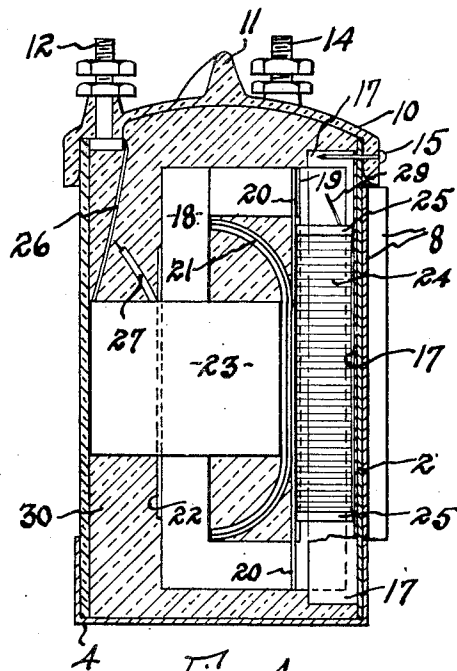


Fig. 4.

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2,068,522

IGNITION TRANSFORMER

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Application November 29, 1935, Serial No. 52,088

17 Claims. (Cl. 175—361)

This invention relates to improvements in the structural features of transformers, and particularly transformers of the type used in automobile and other gas engine ignition.

5 The general object of this invention is to provide an improved form of construction for ignition transformers, with particular relation to reducing the cost of construction of such transformers, and more particularly to provide an arrangement wherein the heat generated within the device may be quickly conducted to a radiator section forming a part of the casing and radiated therefrom to the atmosphere.

10 The many detailed objects of this invention will be apparent from the following description.

15 This invention resides substantially in the combination, construction, arrangement and relative location of parts, all as will be described in greater detail in the following specification.

20 In the drawing,

Figure 1 is a top plan view of an ignition transformer in accordance with this invention;

Figure 2 is a side elevational view thereof;

25 Figure 3 is a top view of the structure with the cover removed; and

Figure 4 is a cross-sectional view taken on the line 4—4 of Figure 2.

30 The device as illustrated comprises a substantially cylindrical or tubular housing 1 made of some suitable insulating material, such as "Bakelite" or other moulded material, fibre, paper, and the like. The casing is preferably formed up into substantially circular form from a sheet of insulating material, which is not long enough to form a complete cylinder on the diameter form. This leaves a gap between the ends of the sheet which is closed by means of a metal plate 2 which is provided with short offset flanges 3 which lie against the inner face of the tube adjacent the ends of the opening. This sheet of metal is of the same length as the casing and is curved transversely so as to lie on the circumference of the casing and completely close the opening therein. This plate 2 can be made of any suitable metal but is preferably of a good heat conductor, such as copper.

45 The lower end of the completed tube thus formed is closed by means of a cylindrical metal cup 4 which has a sliding fit with the end of the casing. This cup is provided with a pair of sockets 5 formed by pressing the metal thereof outwardly so as to receive the heads of bolts or screws 6 by means of which the device may be mounted by nuts, clamps, or other suitable attaching means. The cup member 4 is attached

to the casing in any suitable way, as, for example, by means of bosses or rivets, as indicated at 16. At 8 is a corrugated metal radiator, which is likewise made of a good heat conductor, attached to the side of the tube in contact with the metal wall 2 by means of a series of lugs or tabs 9 which pass through openings in the insulator portion 1 of the tube and are bent over the flanges 3 of the metal wall 2 to lock the radiator in place. The radiator, if desired, may be spot welded at several points to the metal wall to insure greater strength and intimate contact therebetween. As is clear from Figure 4, the metal cup 4 also engages the metal wall 2 so as to add its area to the radiation system of the device.

20 At 10 is indicated a moulded or otherwise formed insulated cap or cover for the other end of the tube which fits down thereover, as indicated in Figure 4, and is locked thereto by any suitable means, such as the pins 15. The cover is provided with a longitudinally curved insulating shield which may be made of the same material as the cover, and in the case of moulding, moulded directly thereon. This shield is positioned so as to electrically isolate the terminal lug 12 from the terminal lugs 13 and 14.

25 The terminal lugs 13 and 14 are low tension terminals of the device to which the primary leads of the transformer are connected and through which the transformer is energized from the current source. The terminal lug 12 is the high tension or high voltage terminal of the device which is connected to one terminal of the secondary winding. Thus the high tension terminal is electrically isolated from the low tension terminals, thereby preventing leakage and flashover.

30 Mounted within the casing and directly in contact with the metal wall 2 is a U-shaped channel member 17, also of a good heat conductor, which is held in place in any suitable manner, either by frictional engagement with the flanged edges of the metal wall 2 and/or by welding, riveting, and the like. The transformer proper comprises a laminated iron core 18, which is illustrated as of the air gap type. In the construction illustrated, the air gap is filled by means of a thin piece of insulating material, as indicated at 19, which may be cemented in place, if desired. At 20 is a thin sheet of suitable insulating material which is of substantially H-form so that the notches at the end enclose the top and bottom legs of the core 18, as will be apparent from Figures 3 and 4. At 21 are

several sheets of insulating material, such as mica, fibre, and the like, which are positioned as shown. At 22 is another sheet or strip of insulating material lying against the outer face of the left hand leg of the core, as shown in Figure 4.

At 23 is the secondary winding which, as is well known in the art, comprises a large number of turns of fine wire suitably insulated from each other. The insulating strip 22 is merely provided to insure prevention of short circuit between the secondary and the core at the point where the lead 27 therefrom issues from the winding. At 24 is the primary winding comprising a relatively few turns of larger insulated wire wrapped upon the core in a single layer over a layer of insulation (not shown, but well known in the art).

The single layer primary winding represents an important and novel feature of this invention. Heretofore ignition transformers have employed primary windings of multiple layers. The use of a single layer primary winding is only possible by reason of the fact that the casing is so constructed and related to the primary winding that the greater amount of heat incident to the use of the primary is readily radiated so as to prevent overheating of the device. Therefore a very important combination of this invention is presented by the use of a concentrated single layer primary winding associated with the heat radiating section of the casing so that overheating is prevented, with the result that a saving of approximately half the amount of copper normally required in the primary is effected. Naturally this reduction in the amount of copper employed reduces the time required to wind the primary, makes for a more rigid and durable construction, and by reason of the heat radiation feature provides a device which will not easily burn out.

It will be noted that the insulating layers 20 and 21 are thus interposed between the secondary winding 23 and the primary winding 24. Fitting on the same leg of the core on which the primary winding is mounted are a pair of insulating washers 25 which hug the ends of the primary winding and are sized so as to snugly fit between the arms or legs of the metal channel 17. The wire 26 representing the other lead of the secondary is connected to the high tension contact 12, as is clear from Figure 4. The other lead 27 of the secondary is connected to one of the leads 28 of the primary, as shown in Figure 3. From this common connection a wire is connected to one of the terminal lugs 13 or 14. The other terminal wire 29 of the primary is connected to the other terminal lead 13 or 14. The entire casing is then filled with any suitable insulating compound well known in the art. By means of the construction disclosed, little or none of this insulating compound gets in or around the primary winding, in view of the fact that it is enclosed by the insulating washers 25 and the metal channel 17. The insulating washers 25 serve to accurately position the primary winding out of contact with the metal shield and to more or less isolate it from immersion in the insulating compound.

By means of this construction it will be apparent that the heat generated in the primary coil is directly radiated to the copper or other metal shield 17, from which it is directly conducted to the metal wall 2 and the metal

radiator 8. Experience with this construction has demonstrated that the device is capable of mass production at low cost, is exceedingly rugged, and highly efficient. The high efficiency of the device is largely attributable to the heat radiating construction employed. This device gives an extremely fast, intense or fat and hot spark, consumes less current than similar devices, and reduces arcing at the breaker points. Furthermore, the device is very compact and pleasing in appearance.

From the above description, the invention will, as is apparent to those skilled in the art, be capable of incorporation in other physical forms without departure from the scope of the invention. It is not my desire, therefore, to be strictly limited to the disclosure as given for purposes of illustration but rather to the scope of the appended claims.

What I seek to secure by Letters Patent is:

1. A transformer as described comprising an insulating casing having a section of its wall formed of metal, a transformer within said casing comprising a core, a primary and a secondary, means for positioning the primary of the transformer adjacent the metal wall section, and metal heat conducting fins secured to both sides of said metal wall section, the fins on the inside of said metal wall section being close to said primary.

2. In a transformer of the type described, the combination comprising a closed insulating casing having a portion of its wall formed by a metal plate, a channel-shaped metal member secured to the metal wall section in contact therewith on the interior of the casing, and a transformer in said casing comprising a core, a secondary and a primary, the primary of the transformer being positioned within said channel member and directly exposed for heat radiation thereto.

3. In a transformer of the type described, the combination comprising a closed insulating casing having a portion of its wall formed by a metal plate, a channel-shaped metal member secured to the metal wall section on the interior of the casing, a transformer in said casing comprising a core, a secondary and a primary, the primary of the transformer being positioned within said channel member, and insulating spacer members mounted on said core and snugly fitting within said channel member.

4. In a transformer of the type described, the combination comprising a closed insulating casing having a portion of its wall formed by a metal plate, a channel-shaped metal member secured to the metal wall section on the interior of the casing, a transformer in said casing comprising a core, a secondary and a primary, the primary of the transformer being positioned within said channel member, insulating spacer members mounted on said core and snugly fitting within said channel member, and heat radiating fins secured to said casing in contact with the metal wall section.

5. In a transformer of the type described, the combination comprising a closed insulating casing having a portion of its wall formed by a metal plate, a channel-shaped metal member secured to the metal wall section on the interior of the casing, a transformer in said casing comprising a core, a secondary and a primary, the primary of the transformer being positioned within said channel member, insulating spacer members mounted on said core and snugly fit-

ting within said channel member, heat radiating fins secured to said casing in contact with the metal wall section, and an insulating compound filling said casing with the exception of the space around the primary and between said spacer members.

6. A transformer construction comprising a casing body formed of a sheet of insulating material and a metal wall section, closure members for the ends of said casing body, and a transformer within the casing body comprising a core, a primary and a secondary, said primary winding being positioned in close proximity to the metal wall section.

7. A transformer construction comprising a casing body formed of a sheet of insulating material and a metal wall section, closure members for the ends of said casing body, a transformer within the casing body comprising a core, a primary and a secondary, said primary winding being positioned in close proximity to the metal wall section, and a metal channel member positioned around the primary winding and contacting the metal wall section.

8. A transformer construction comprising a casing body formed of a sheet of insulating material and a metal wall section, closure members for the ends of said casing body, a transformer within the casing body comprising a core, a primary and a secondary, said primary winding being positioned in close proximity to the metal wall section, and a corrugated metal radiator secured to said casing in contact with said metal wall section.

9. A transformer construction comprising a casing body formed of a sheet of insulating material and a metal wall section, closure members for the ends of said casing body, a transformer within the casing body comprising a core, a primary and a secondary, said primary winding being positioned in close proximity to the metal wall section, and a corrugated metal radiator secured to said casing in contact with said metal wall section, said radiator having integral lugs passing through the casing body and engaging the edges of the metal wall section.

10. A transformer construction comprising a casing body formed of a sheet of insulating material and a metal wall section, closure members for the ends of said casing body, a transformer within the casing body comprising a core, a primary and a secondary, said primary winding being positioned in close proximity to the metal wall section, a metal channel member positioned around the primary winding and contacting the metal wall section, and a corrugated metal radiator secured to said casing in contact with said metal wall section.

11. A transformer construction comprising a casing body formed of a sheet of insulating material and a metal wall section, closure members for the ends of said casing body, a transformer within the casing body comprising a core, a primary and a secondary, said primary winding being positioned in close proximity to the metal wall section, a metal channel member positioned around the primary winding and contacting the metal wall section, and insulating spacer members mounted on said core and engaging said channel member.

12. A transformer construction comprising a casing body formed of a sheet of insulating material and a metal wall section, closure members for the ends of said casing body, a transformer within the casing body comprising a core, a pri-

mary and a secondary, said primary winding being positioned in close proximity to the metal wall section, a metal channel member positioned around the primary winding and contacting the metal wall section, a corrugated metal radiator secured to said casing in contact with said metal wall section, and insulating spacer members mounted on said core and engaging said channel member.

13. A transformer construction as described, comprising a casing body composed of insulating material and a metal wall section, a cup-shaped closure member for one end of said casing body, an insulating closure member for the other end of the casing body having a well extending thereacross, a pair of low tension terminals secured to said insulating closure member on one side of said wall, and a high tension terminal secured to said insulating closure member on the other side of said wall, and a transformer in said casing comprising a core, a primary and a secondary, the primary terminals being connected to the low tension terminals and the secondary being connected to the high tension terminal, the primary of said transformer being mounted adjacent the metal wall section.

14. A transformer construction as described, comprising a casing body composed of insulating material and a metal wall section, a cup-shaped closure member for one end of said casing body, an insulating closure member for the other end of the casing body having a wall extending thereacross, a pair of low tension terminals secured to said insulating closure member on one side of said wall, and a high tension terminal secured to said insulating closure member on the other side of said wall, a transformer in said casing comprising a core, a primary and a secondary, the primary terminals being connected to the low tension terminals and the secondary being connected to the high tension terminal, the primary of said transformer being mounted adjacent the metal wall section, and an insulating compound substantially filling said casing.

15. A transformer construction as described, comprising a casing body composed of insulating material and a metal wall section, a cup-shaped closure member for one end of said casing body, an insulating closure member for the other end of the casing body having a wall extending thereacross, a pair of low tension terminals secured to said insulating closure member on one side of said wall, and a high tension terminal secured to said insulating closure member on the other side of said wall, a transformer in said casing comprising a core, a primary and a secondary, the primary terminals being connected to the low tension terminals and the secondary being connected to the high tension terminal, the primary of said transformer being mounted adjacent the metal wall section, and a metal channel member secured in said casing so as to surround the primary winding and contact the metal wall section.

16. A transformer construction as described, comprising a casing body composed of insulating material and a metal wall section, a cup-shaped closure member for one end of said casing body, an insulating closure member for the other end of the casing body having a wall extending thereacross, a pair of low tension terminals secured to said insulating closure member on one side of said wall, and a high tension

terminal secured to said insulating closure member on the other side of said wall, a transformer in said casing comprising a core, a primary and a secondary, the primary terminals being connected to the low tension terminals and the secondary being connected to the high tension terminal, the primary of said transformer being mounted adjacent the metal wall section, a metal channel member secured in said casing so as to surround the primary winding and contact the metal wall section, and a fin-like metal radiator

member secured to said casing in contact with said metal wall section.

17. In a transformer of the type described, the combination comprising a container having a heat radiating metal wall section, a transformer within said casing comprising a core, a high tension secondary and a primary comprising a single layer of insulated wire, said primary being disposed in close heat-conductive proximity to the metal wall section and heat insulated from the remainder of the structure.

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