Jan. 4, 1927. 1,613,494

E. VON LEPEL

CURRENT CONVERTER

Filed June 20, 1925

FIG.1.

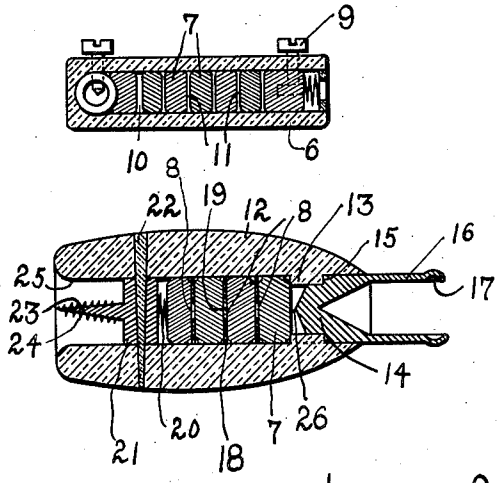


FIG.4.

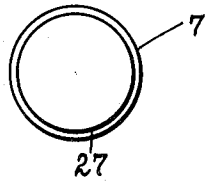


FIG.2.

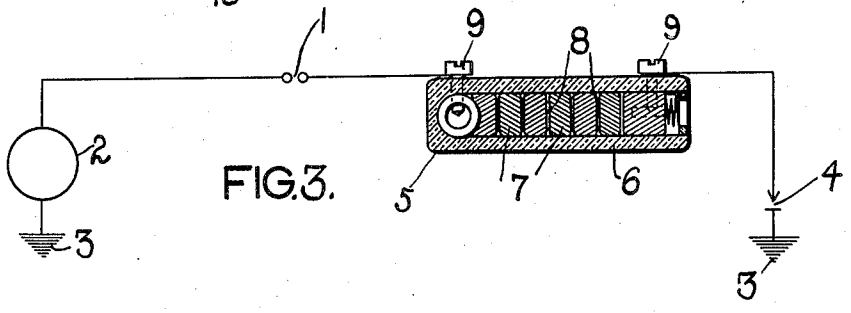


FIG.3.

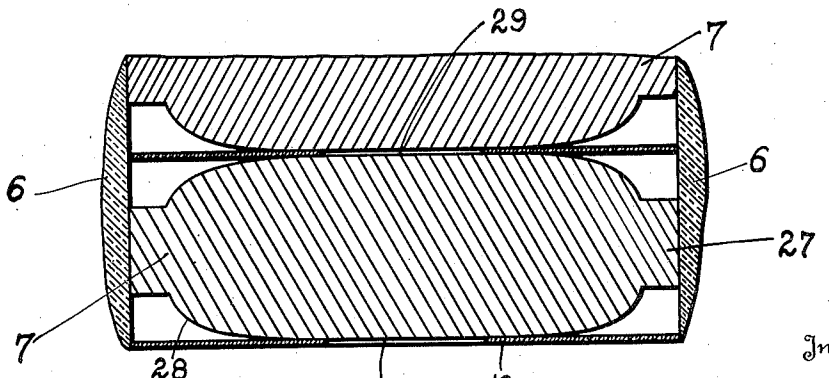


FIG.5.

Inventor

Egbert von Lepel

By Emil Bönnelycke

Attorney

Patented Jan. 4, 1927. 1,613,494

UNITED STATES PATENT OFFICE.

EGBERT VON LEPEL, OF BERLIN-CHARLOTTENBURG, GERMANY.

CURRENT CONVERTER.

Application filed June 20, 1925. Serial No. 38,594.

In my U. S. patent application, Serial No. 18,253, filed March 25, 1925, an arrangement and device is described which, together with other properties, is also adaptable to prevent the short circuiting of the spark plug, due to carbon or oil. The object of the present invention is to adapt the current converter shown and described in my co-pending application to a battery and coil ignition. It has been discovered that a better prevention of short circuits in the spark plug is attained by placing a large gap in combination with a series of small gaps. Such an arrangement also creates a series of strong current impulses of momentary intensity in the spark plug in order to prevent the weak currents from passing through the plug. The converter functions in the beginning of every sparking by the cooperation of the large gap and the plurality of small gaps in that while between the current impulses which follow during every sparking period the large gap remains ionized so that the high speed interruptions of the converter remains in operation.

It is a further object of this invention to construct a device which will contain the large gap in series with the series of small gaps. A still further object resides in the specific construction of the electrodes which form the gaps, in that they are constructed so as to present convex surfaces between which the gaps are arranged.

Other objects will be apparent from the following specification, taken in connection with the accompanying drawing in which like parts are indicated by the same reference numerals and in which

Figure 1 is a cross-section of the current converter, having the large gap and the small gaps contained therein.

Fig. 2 is a similar view of a preferred form of the invention.

Fig. 3 shows a wiring diagram and a cross-section of a converter inserted therein.

Fig. 4 is a front view of one of the electrodes, and

Fig. 5 is a part sectional view on a greatly enlarged scale showing the construction of the electrode.

The device can be so arranged that a large gap 1 can be inserted in series in a circuit in which the source of current is indicated at 2, the grounds at 3 and the spark plug at 4. The current converter 5 is here shown as containing a casing 6 of any suitable insulating material in which is arranged a plurality of electrodes 7 which are separated by small mica discs. The electrodes in this arrangement form the series of narrow gaps 8 and by means of screws 9 the converter is secured in the circuit as clearly shown in Fig. 3.

Figs. 1 and 2 show the large gap enclosed in the casing together with the small gaps, and in Fig. 1 the large gap is indicated at 10 and the small gaps at 11. Fig. 2 shows the preferred form in which a casing 12 of any suitable insulating material is provided near one end with an annular shoulder 13 against which an electrode 7 is placed and at the other side the large gap electrode 14 is placed. The large gap electrode is thus spaced at its correct distance 26 from the electrode 7 due to the shoulder 15 thereon which abuts against the shoulder 13. In order to fasten the converter on the spark plug a pair of spring arms 16 are provided integral with the electrode 14 which are provided with depressions 17 so that they may snap on a ball on the central electrode of the spark plug. The casing 12 and electrode 14 can be suitably secured together by inserting the electrode while the casing is cooling after moulding so that the casing will shrink and thus secure the electrode in place. A series of electrodes 7 are arranged in the casing in order to form three gaps 8, the electrodes being spaced by means of thin discs of mica 18 having a perforation 19 in the center. A spring 20 forces the electrodes together and the end connection 21 is secured in the casing by means of a pin 22. This end connection is provided with a screw 23 having large threads 24 which is adapted to be secured by rotating the device on a wire, the side 25 of the casing thus forming a tight fit for the wire since it will be forced from the center outwardly, due to the diameter of the screw. This construction thus shows a large gap 26 and a plurality of small gaps, all of which are arranged in series as clearly shown.

The electrode 7 is preferably made of aluminum or any other suitable metal or alloy by stamping and is shaped as shown in Figs. 4 and 5. The surfaces are slightly convex and are provided with an annular flange 27. This construction is necessary in order to prevent the current, which always tends to discharge itself from a sharp corner, from injuring the electrodes. Thus the

rounded surfaces 28 will force the discharge to take place near the center of the electrode, which is approximately through the perforation 19 of the mica disc 18. The distance between the flanges is therefore many times greater than the distance between the convex surfaces and therefore the electric current will not chip off the edges of the electrodes. The current will jump the gap at 29 for example, and as the mica is gradually decomposed the distance between the electrodes remains unchanged. Mica is used for the discs, since it is but slowly affected by the heat and sparks of the current and when it decomposes it forms a mass which maintains its non-conductive properties and will also preserve the spaced relation of the electrodes.

The form of the electrode 14 at the sparking point can be sharp, flat or spherical and it can be made of any suitable material.

The construction shown in Fig. 1 can be suitably made by inserting a thick disc of mica in the gap 10 and thin discs at 11, the discs of course having perforations in the center.

I claim as my invention:—

1. An ignition circuit for an internal combustion engine having included in it a large spark gap; a plurality of small spark gaps cooperating with said large gap in order to provide effective sparking of the spark plug; and a spark plug in circuit with said large spark gap and said small spark gaps.

2. An ignition circuit for an internal combustion engine having included in it a large spark gap; and a plurality of small spark gaps, said gaps being in series with themselves and with the spark plug in order to provide effective sparking of the spark plug.

3. A current converter for the spark plug of an ignition circuit of an internal combustion engine comprising a plurality of small spark gaps; and a large spark gap cooperating with said small gaps in order to provide effective sparking of the spark plug.

4. A current converter for the ignition circuit of an internal combustion engine comprising an insulating casing; a plurality of electrodes in said casing spaced to form a plurality of small spark gaps; and a large gap electrode in said casing spaced to form a large spark gap.

5. A current converter for the ignition circuit of an internal combustion engine comprising an insulating casing provided with a shoulder adjacent one end; a plurality of electrodes in said casing spaced to form a plurality of small spark gaps, one of said electrodes abutting against said shoulder; and a large spark gap electrode abutting against the shoulder and spaced from the first-named electrode which also abuts against the shoulder in order to form a large spark gap.

6. A current converter for the ignition circuit of an internal combustion engine comprising an insulating casing provided with a shoulder adjacent one end; a plurality of electrodes in said casing spaced to form a plurality of small spark gaps, one of said electrodes abutting against said shoulder; and a large spark gap electrode abutting against the shoulder and spaced from the first-named electrode which also abuts against the shoulder in order to form a large spark gap, said large spark gap having means thereon for securing it to a spark plug.

7. A circuit converter for the ignition circuit of an internal combustion engine comprising an insulating casing provided with a shoulder adjacent one end; a plurality of electrodes in said casing spaced to form a plurality of small spark gaps, one of said electrodes abutting against said shoulder; a large spark gap electrode abutting against the shoulder and spaced from the first-named electrode which also abuts against the shoulder in order to form a large spark gap; and an end connection for connecting the converter to a wire of the ignition system.

8. A current converter for the ignition circuit of an internal combustion engine comprising an insulating casing; a plurality of electrodes in said casing spaced to form a plurality of small spark gaps; a large gap electrode in said casing spaced to form a large spark gap; and a screw in said casing having large threads which is adapted to be inserted into a wire of the ignition system.

9. A current converter for the ignition circuit of an internal combustion engine comprising an insulating casing; a plurality of electrodes in said casing spaced to form a plurality of small spark gaps; a large gap electrode in said casing spaced to form a large spark gap; a screw in said casing having large threads which is adapted to be inserted into a wire of the ignition system; and a pair of spring arms on the large electrode which are adapted to secure the converter to the spark plug.

10. A current converter for the ignition circuit of an internal combustion engine comprising an insulating casing; a plurality of electrodes in said casing spaced to form a plurality of small spark gaps; a large gap electrode in said casing spaced to form a large spark gap; and a spring arranged in said casing adapted to keep said electrodes in the correct spaced relation.

11. A current converter for the ignition circuit of an internal combustion engine comprising an insulating casing; a plurality of electrodes in said casing; a disc arranged between the electrodes in order to maintain the electrodes in spaced relation

to form a plurality of small spark gaps; and a large gap electrode in said casing spaced to form a large spark gap.

12. A current converter for the ignition circuit of an internal combustion engine comprising an insulating casing; a plurality of electrodes in said casing; a disc arranged between the electrodes in order to maintain the electrodes in spaced relation to form a plurality of small spark gaps; a large gap electrode in said casing spaced to form a large spark gap; and a spring in said casing adapted to force said electrodes against the discs.

13. A current converter for the ignition circuit of an internal combustion engine comprising an insulating casing; a plurality of aluminum electrodes in said casing; a mica disc arranged between the electrodes in order to maintain the electrodes in spaced relation to form a plurality of small spark gaps; and a large gap electrode in said casing spaced to form a large spark gap.

14. An electrode for a current converter comprising a metal member having convex side portions in order that the sparking shall take place approximately in the center of said member.

15. An electrode for a current converter comprising a metal member having convex side portions in order that the sparking shall take place approximately in the center of said member; and a flange around the periphery of said member, said convex portions preventing any sparking taking place around the edges of the member.

16. An electrode for a current converter comprising a circular flat metal member having convex side portions in order that the sparking shall take place approximately in the center of said member; and a flange integral with the member around the periphery of said member, said convex portions preventing any sparking from the flange.

In testimony whereof I affix my signature.

EGBERT VON LEPEL.