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Kranz et al.

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[54] **IMPULSE TRANSFORMER**

[75] Inventors: **Hans Werner Kranz**, Regensburg; **Max Schultes**, Piehlmule, both of Germany

[73] Assignee: **Siemens Aktiengesellschaft**, Munchen, Germany

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Related U.S. Application Data

[63] Continuation of Ser. No. 310,852, Nov. 30, 1972, abandoned.

[30] **Foreign Application Priority Data**

Dec. 1, 1971 Germany 2159491

[52] **U.S. Cl.** **336/96**, 336/175, 336/192, 336/223, 336/225

[51] **Int. Cl.** **H01f 27/28**

[58] **Field of Search** 336/92, 174, 175, 223, 336/225, 192, 232; 219/235

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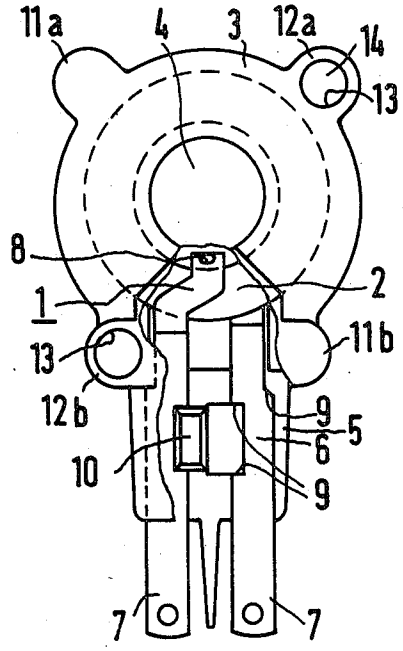
Primary Examiner—Thomas J. Kozma
Attorney, Agent, or Firm—Kenyon & Kenyon Reilly Carr & Chapin

[57] **ABSTRACT**

An impulse transformer for motor vehicle ignition systems equipped with at least one ignition cable is disclosed. The impulse transformer includes an annular core for receiving the ignition cable and a winding having a turn surrounding the core. A housing of synthetic material encapsulates the core and winding. The turn is configured from a single stamped member having respective end portions and a mid portion integral with the end portions. The mid portion consists of a plurality of integral segments one following the other in receding steplike fashion so as to cause the end portions to be mutually adjacent in a common plane at a predetermined spacing from each other after the stamped member has been bent about the core to form the turn. The end portions are configured at least in part as flat plug contacts suitable for insertion into a plug-in socket.

4 Claims, 6 Drawing Figures



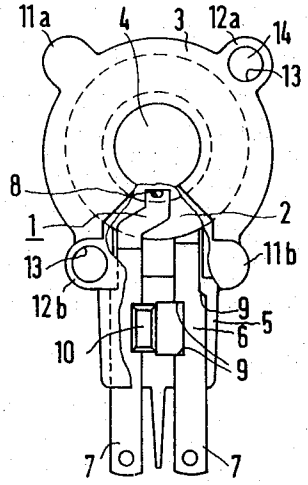


Fig.1

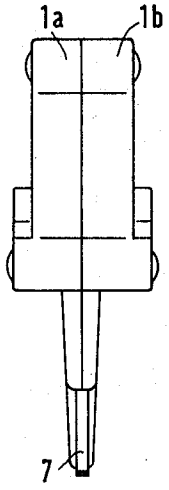


Fig.2

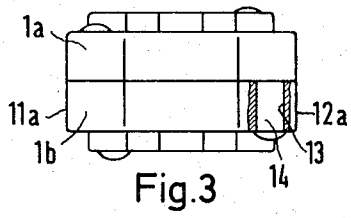


Fig.3

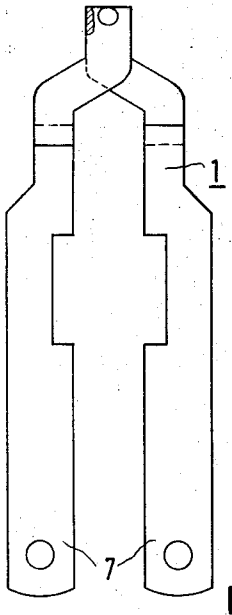


Fig.4

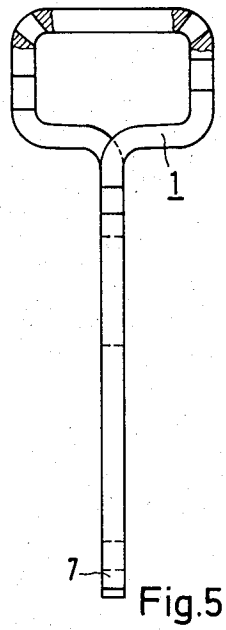


Fig.5

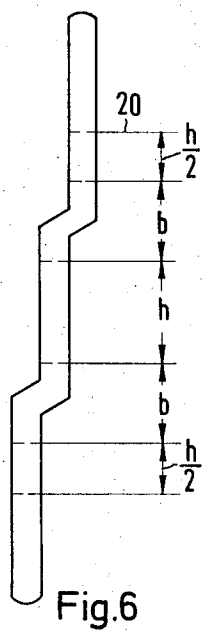


Fig.6

IMPULSE TRANSFORMER

This is a continuation of application Ser. No. 310,852, now abandoned, filed Nov. 30, 1972.

BACKGROUND OF THE INVENTION

The invention relates to a pulse transformer for ignition systems of motor vehicles. As more and more motor vehicles are provided with electronic equipment, it is important to develop small assemblies of simple configuration. Pulse transformers for ignition systems of motor vehicles usually consist of many parts and are relatively complex. A particular problem is to assure adequate electrical insulation.

SUMMARY OF THE INVENTION

It is an object of the invention to provide an impulse transformer wherein the winding is configured from a stamped member and is enclosed in an easily produced encapsulation of insulating material wherein it is secure in its position and electrically insulated.

The impulse transformer of the invention is applicable for use in motor vehicle ignition systems equipped with at least one ignition cable. According to the invention, the foregoing objects are realized by providing a winding that consists of a single stamped and bent part with a developed profile which is set back in stair-like fashion so that the ends of the winding come to lie in one plane, next to each other with spacing, after they are bent to form the turn. By means of appropriate mountings in the housing configured as a plastic encapsulation, a secure lateral support is obtained. The turnouts around the annular core serve to secure the position axially.

The impulse transformer of the invention thus includes as a feature an annular core for receiving the ignition cable and a winding including a turn surrounding the core. A housing of synthetic material encapsulates the core and winding. The turn is configured from a single bendable stamped member having respective end portions and a mid portion integral with the end portions. The mid portion consists of a plurality of segments one following the other in receding step-like fashion so as to cause the end portions to be mutually adjacent in a common plane at a predetermined spacing from each other after the stamped member has been bent about the core to form the turn. The end portions are configured at least in part as flat plug contacts suitable for insertion into a plug-in socket.

According to another embodiment of the invention, the feature is provided that the stamped member essentially has the profile of two letters "L" having respective bottom segments mutually adjacent and placed one above the other. The ends of the base segments are connected by a bridge extending in the direction of the long segments of the L's. The bridge corresponds to the height of the annular core.

Ahead of the ends of the winding configured as flat plug contacts, there are provided edges extending transversely to the direction of the flat plug contacts which are within the plastic encapsulation. These edges are formed by forming or punching. The plastic encapsulation has corresponding receptacles for receiving these edges.

Each of the end portions of the stamped member can be considered as being apportioned into an intermediate portion and a tip portion, the tip portion being in the form of a flat plug contact suitable for insertion into a plug-in socket. The intermediate portion is within the housing and has edges formed thereon so as to extend in a direction transverse to the longitudinal direction of the tip portion. The housing has mounting portions for receiving the edges.

On the one hand, this achieves a particularly advantageous structure of the winding and, on the other hand, provides additional security of the axial position.

A particularly advantageous embodiment of the plastic encapsulation is obtained by making it of two identical halves, each including an annular-shaped mounting portion and a portion for accommodating the twist of the turn that is to be encapsulated. The entire pulse transformer is then constructed of only three different parts.

Although the invention is illustrated and described herein as an impulse transformer, it is nevertheless not intended to be limited to the details shown, since various modifications may be made therein within the scope and the range of the claims. The invention, however, together with additional objects and advantages will be best understood from the following description and in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a plan view of the pulse transformer according to the invention. A portion of the housing is broken away to show the configuration of the winding.

FIG. 2 is a side elevation of the pulse transformer encapsulated in a housing made up of two identical halves.

FIG. 3 is an end view of the transformer shown in FIG. 1.

FIG. 4 shows the winding, exaggerated in size, after being bent to form the turn. The winding is viewed from the same position as in FIG. 1.

FIG. 5 shows the winding according to FIG. 4 in side elevation.

FIG. 6 shows the stamped member before it is bent to form the winding.

DESCRIPTION OF THE PREFERRED EMBODIMENTS OF THE INVENTION

The pulse transformer according to FIG. 1 consists of a winding 1 about an annular core 2 which is encapsulated in a housing 3 of insulating material. The housing can be fabricated of plastic by injection molding or of shells joined together. An ignition cable can be brought through the opening 4. If made of two identical halves according to FIG. 2, the housing 3 has a formed receptacle 5 with slots for the intermediate winding regions 6 ahead of the ends 7 of the winding. The ends 7 are configured as plug contacts.

The winding 1 is stamped utilizing stamping and bending techniques from a material in sheet form, for example, copper. The winding is bent around the annular core 2 so that the ends 6 and 7 of the winding come to lie in one plane next to each other at a predetermined spacing. At the locations where it is intended to bend the winding, it is advantageous to provide small punched holes to facilitate bending around the annular core to form the turn; this makes the net cross-section at the bending locations less than over the remainder of the stamped member. This configuration of the winding obtained by bending is realizable because the winding has in the unwound condition, a profile which

recedes in step-like fashion as shown in rough schematic in FIG. **6.** The bending points are indicated by the lines **20.** The height of the annular core **2** is indicated by *h* and the width of the annular core by *b*.

At the regions **6** of the winding (ahead of the ends **7**), there are provided edges **9** which extend within the plastic encapsulation transversely to the longitudinal direction of the flat plug contacts **7**; these edges can be obtained by forming or punching. Corresponding dome-like projections **10** of the receptacle **5** of the housing engage at this location so that additional support is obtained for holding the axial position.

If the housing is built up of identical halves **1**a and **1***b* as in the embodiment according to FIG. **2,** projections **11***a*, **11***b* and **12***a* as well as **12***b* may be provided at the ring-like receptacle (FIG. **1**). The upper half of the housing according to FIG. **1** can then have pins at the projections **11***a* and **11***b*, and the holes **13,** as shown, in the projections **12***a* and **12***b*, with which the pins **14,** as per FIG. **3,** can engage. In the assembly of the halves of the housing, these pins can also be deformed by heating.

To secure the annular core itself in its position, a circular disk of foam material can be inserted prior to assembly into at least one of the half-shells if the housing is a composite housing.

In FIGS. **2** and **3,** a pulse transformer with a housing consisting of two identical halves **1***a* and **1***b* is shown in a side elevation and in end view respectively.

As may be seen from FIGS. **4** to **6,** the winding *l* has essentially the profile of two letters "L" facing each other with the bottom segments placed above the other, the ends of the bottom segments being connected by a bridge which extends in the direction of the long segments of the L's and which is as long as the height of the annular core.

The described configuration of the winding furthermore facilitates clamping in the case of a housing made by injection molding.

What is claimed is:

1. An impulse transformer for motor vehicle ignition systems equipped with at least one ignition cable, comprising:

an annular core for receiving the ignition cable;

a housing fabricated of synthetic material encapsulating said core;

a single stamped flat member, comprising a winding and including a single turn on said core, said member having respective end portions and a midportion integral with said end portions and a step-like profile corresponding to two letters L's having respective base segments facing each other, said letter L's being placed one above the other, the ends of the base segments being connected by a bridge extending in the direction of the long segments of the L's, the bridge having a length corresponding to the height of said annular core, each of said end portions being apportioned into an intermediate portion and a tip portion with said tip portion being in the form of a flat plug contact suitable for insertion into a plug-in socket, said intermediate and said tip portions being mutually adjacent and disposed flat in a common plane at a predetermined spacing from each other, said intermediate portions being disposed within said housing of synthetic material and having edges formed thereon which extend in a direction transverse to the longitudinal direction of said tip portions, and said housing having mounting portions for receiving said edges.

2. The impulse transformer of claim **1,** said stamped member having respective net cross-sections at locations thereon where said member is to be bent to form said turn, said net cross-sections being less than the cross-section over the remainder of said stamped member whereby the bending of said member is facilitated at said locations.

3. The impulse transformer of claim **1,** said stamped member having openings at locations thereon where said member is to be bent to form said turn whereby the bending of said member is facilitated at said locations.

4. The impulse transformer of claim **1,** said housing being made up of two identical halves, each of said halves comprising an annular mounting portion, and an additional portion formed thereon for encapsulating said intermediate portions of said end portions.

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