United States Patent

[11] 3,585,553

[72] Inventors **William L. Muckelroy; Marshall M. Algor, both of Washington, D.C.**

[21] Appl. No. **29,191**
[22] Filed **Apr. 16, 1970**
[45] Patented **June 15, 1971**
[73] Assignee **The United States of America as represented by the Secretary of the Army**

[54] **MICROMINIATURE LEADLESS INDUCTANCE ELEMENT**
4 Claims, 3 Drawing Figs.

[52] **U.S. Cl.** ..... **336/192,** 317/101 CC, 336/208
[51] **Int. Cl.** **H01f 15/10**
[50] **Field of Search** ..... 336/192, 208, 198; 317/101 CC; 174/52.6; 338/322

[56] **References Cited**

UNITED STATES PATENTS

3,271,507	9/1966	Elliott	174/52.6
3,312,919	4/1967	Ross	336/198 X
3,393,388	7/1968	Young	336/198 X
3,404,214	10/1968	Elliott	174/52.6
3,460,246	8/1969	Hatton	336/208 X

Primary Examiner—Thomas J. Kozma
Attorneys—Harry M. Saragovitz, Edward J. Kelly, Herbert Berl and J. D. Edgerton

ABSTRACT: A leadless inductance element. The element comprises a nonconductive core adapted to receive a wire winding and having first and second flanges located at the terminal portions of the core to confine the wire winding to the core. The end face of each of the flanges is flattened and an electrically conductive coating is applied to provide electrical contact with the substrate. A groove is located in each of the flanges and is adapted to receive the terminal portions of the wire winding. Finally an electrically conductive path connects the terminal portions of the wire winding with the flattened electrical contacts at the two flanges.

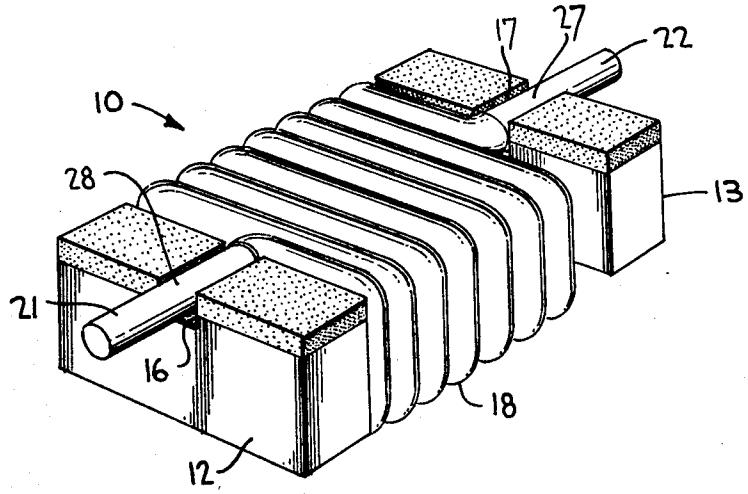


FIG. 1

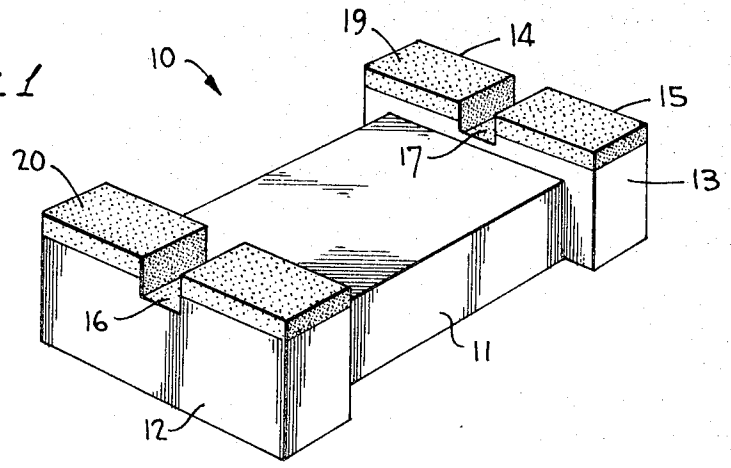


FIG. 2

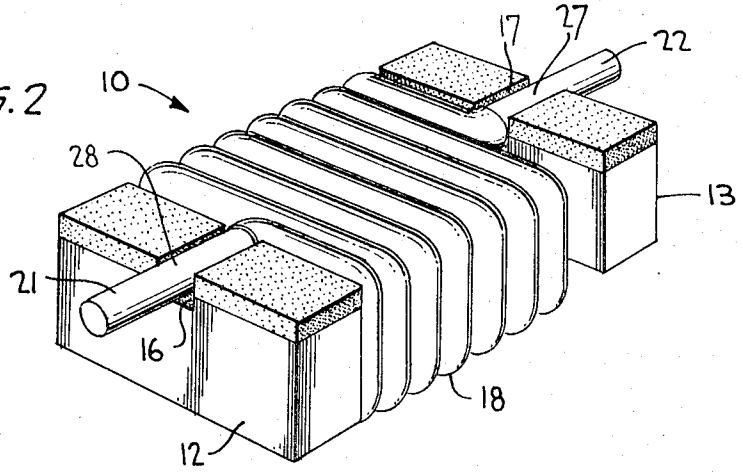
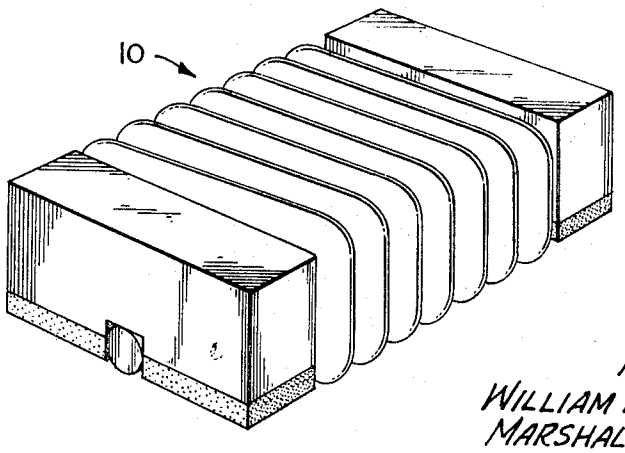


FIG. 3



INVENTORS,
WILLIAM L. MUCKELROY
MARSHALL M. ALGOR
BY Harry M. Saragovitz
Edward J. Kelley
Herbert Berl
J. D. Edgerton
ATTORNEYS

MICROMINIATURE LEADLESS INDUCTANCE ELEMENT

RIGHTS OF THE GOVERNMENT

The invention described herein may be manufactured, used, and licensed by or for the United States Government for governmental purposes without the payment to me of any royalty thereon.

BACKGROUND OF THE INVENTION

This invention relates to inductance elements, and more particularly to a microminiature leadless inductance element for use as a chip on a substrate pattern.

In the manufacture and assembly of microminiature circuits for use on substrate patterns it is desirable that all the electrical elements which are mounted on the substrate be in the form of leadless inverted devices (LID), commonly known as chips. The use of such chips makes it possible to employ a numerically controlled automatic bonding tool for providing complete and automatic fabrication of these microminiature circuits. Electrical elements such as capacitors, resistors, transistors and diodes are generally available in microminiature chip form for use on substrates; however, a great deal of difficulty has been encountered in producing electrical inductors in microminiature chip form. In the prior art, the process of attaching and mounting inductors to microminiature substrates has usually required that the two terminal portions of wire from the inductor be separately and individually soldered to the substrate pattern. This individual treatment of inductors is inefficient and extremely time consuming.

It is therefore a primary object of this invention to provide an inductor in the form of a microminiature chip.

It is another object of this invention to provide a leadless inductance element.

Still another object of this invention is to provide a leadless inductance element which may be bonded to a printed circuit by using an automated bonding tool.

Yet another object of the invention is to eliminate the need for separate soldering of wires from the inductance element.

SUMMARY OF THE INVENTION

Briefly in accordance with this invention, a leadless inductance element comprises a nonconductive core adapted to receive a wire winding and having first and second flanges located at the terminal portions of the core to confine the wire winding to the core The end face of each of the flanges is flattened and an electrically conductive coating is applied to provide electrical contact with the substrate. A groove is located in each of the flanges and is adapted to receive the terminal portions of the wire winding. Finally an electrically conductive path connects the terminal portions of the wire winding with the flattened electrical contacts at the two flanges.

BRIEF DESCRIPTION OF THE DRAWINGS

The specific nature of the invention as well as other objects, aspects, uses and advantages thereof will clearly appear from the following description and from the accompanying drawing in which:

FIG. 1 is a perspective view of the coil bobbin for use in connection with this invention.

FIG. 2 is a perspective view illustrating the bottom portion of the inductance element in accordance with this invention.

FIG. 3 is a perspective view illustrating the top portion of the inductance element in accordance with this invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to FIG. 1, coil bobbin **10** comprises a ceramic nonconductive core **11** having two ceramic nonconductive flanges **12** and **13** located at the two ends of the core. A pair of projections or legs **14** and **15** are provided at each of the two flanges and grooves **16** and **17** are situated between the two projections. The end faces of the two legs are flattened and provided with electrically conductive coatings **19** and **20** which also extend over grooves **16** and **17**.

Referring now to FIG. 2, coil bobbin **10** is shown having a wire **18** wound around the core **11**. Terminal portions **27** and **28** of wire **18** are stripped of insulation and are inserted into grooves **16** and **17**, after which the terminal portions are secured within the grooves by means of solder or other suitable securing means. Once adequately secured within grooves **16** and **17**, the extended portions **21** and **22** of wire **18** are cut off flush with flanges **12** and **13** thereby leaving a completed leadless inductive element as shown in FIG. 3. The inductance element in FIG. 3 is then used as a chip and placed directly upon a printed circuit substrate using legs **14** and **15** as the electrical contacts with the substrate.

It will be appreciated that a novel leadless inductance element has been provided which can be automatically handled in a compatible manner along with other leadless inverted devices.

We wish it to be understood that we do not desire to be limited to the exact details of construction shown and described, for obvious modifications can be made by a person skilled in the art.

I claim as my invention:

1. A leadless inductance element comprising:
   a. a nonconductive core having a wire winding thereon;
   b. first and second flanges located at the terminal portions of said core to confine said wire winding to said core;
   c. an electrically conductive coating on the end face of each of said flanges for providing electrical contacts with a substrate;
   d. a groove located in each of said flanges for receiving the terminal portions of said wire winding; and
   e. an electrically conductive path between the terminal portions of said wire winding and said electrical contacts.

2. The device of claim 1 wherein each of said flanges comprises first and second legs separated by said groove.

3. The device of claim 1 wherein the ends of said wire winding are stripped of insulation to provide electrical contact between said winding and said conductive coating.

4. The device of claim 3 further comprising means to secure the ends of said winding within said grooves.