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(54) Magnetic module and modular bobbin thereof

(57) Disclosed is a magnetic module including a modular bobbin 10, a core module 400 and a conductive wire 300. The modular bobbin 10 includes a first bobbin 100 and a second bobbin 200. The first bobbin 100 includes a first shaft 110 having a first pivoting portion 130 and a first snapping portion 140 disposed on the first shaft 110. The second bobbin 200 includes a second shaft 210 having a second pivoting portion 230 for pivoting the first pivoting portion 130 and a second snapping portion 240 for snapping the first snapping portion 140, and both second pivoting portion 230 and second snapping portion 240 are disposed on the second shaft 210. The core module 400 includes an inner core 401 installed between the first bobbin 100 and the second bobbin 200. The conductive wire 300 is respectively wound around the first shaft 110 and the second shaft 210.

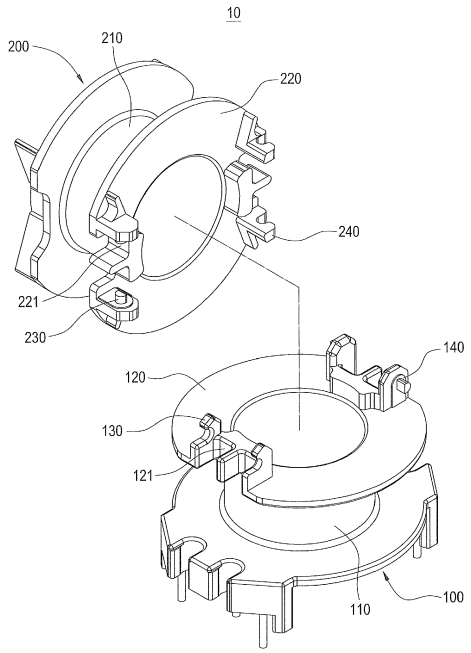


FIG.2

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Description

TECHNICAL FIELD

[0001] The present disclosure relates to a bobbin of a magnetic module, and more particularly to a modular bobbin that can be detachably and pivotally connected.

BACKGROUND OF THE DISCLOSURE

[0002] In general, the structure of a multiple winding transformer includes a plurality of bobbins connected with each other, and the bobbins are connected by male and female buckles, and thus the assembling process takes more time, and the male and female buckles may be broken easily when removing the buckles. In addition, the bobbins of the conventional multiple winding transformer are fixed after they are assembled, so that a wire cannot be wound from one bobbin to the other, or a core cannot be installed between the bobbins. As a result, most conventional multiple winding transformers require a plurality of conductive wires wound around the bobbins respectively, and then the core is installed between the bobbins, and the conductive wires are soldered and electrically conducted with one another.

[0003] In view of the aforementioned drawbacks of the conventional multiple winding transformer, the inventor of the present disclosure based on years of experience in the related industry, and finally developed a magnetic module and a bobbin of the magnetic module in accordance with the present disclosure to overcome the drawbacks of the prior art.

SUMMARY OF THE DISCLOSURE

[0004] Therefore, it is a primary objective of the present disclosure to provide a magnetic module and a modular bobbin applied in the process of winding a plurality of bobbins by a single wire.

[0005] To achieve the aforementioned objective, the present disclosure provides a magnetic module comprising a modular bobbin, a core module and a conductive wire. The modular bobbin comprises a first bobbin and a second bobbin, and the first bobbin includes a first shaft, and a first pivoting portion and a first snapping portion disposed at an end of the first shaft and arranged on two opposite sides of the end of the first shaft respectively, and the second bobbin includes a second shaft coaxially installed with the first shaft, and a second pivoting portion and a second snapping portion disposed at an end of the second shaft and arranged at two opposite sides of the end of the second shaft respectively, and the second pivoting portion is pivotally coupled to the first pivoting portion, and/or the second snapping portion is detachably latched to the first snapping portion, so that the first bobbin and the second bobbin may be pivoted and rotated by the first pivoting portion and the second pivoting portion to separate the second snapping portion from the first snapping portion, and/or the first bobbin and the second bobbin may be pivoted and rotated by the first snapping portion and the second snapping portion to separate the second pivoting portion from the first pivoting portion. The core module includes an inner core, and the inner core is situated between the first bobbin and the second bobbin when the second snapping portion is separated from the first snapping portion. The conductive wire is wound around the first shaft and the second shaft.

[0006] Preferably, the first shaft has a first flapper, and the first pivoting portion is disposed at the first flapper, and the second shaft has a second flapper, and the second pivoting portion is disposed at the second flapper, and the inner core is installed between the first flapper and the second flapper. Preferably, a first wire crossing slot is formed at an end of the first flapper, and a second wire crossing slot is formed at an edge of the second flapper.

[0007] Preferably, the conductive wire includes a wire crossing section, and a first winding section and a second winding section are extended from both ends of the wire crossing section and wound around the first shaft and the second shaft respectively, and the wire crossing section is disposed between the first flapper and the second flapper, and both ends of the wire crossing section are contained into the first wire crossing slot and the second wire crossing slot respectively. Preferably, the first wire crossing slot and the first pivoting portion are disposed adjacent to each other, and the first wire crossing slot is formed at a position corresponsive to the position of the second wire crossing slot, and the second wire crossing slot and the second pivoting portion are arranged adjacent to each other.

[0008] Preferably, the first bobbin is connected to a second bobbin in different ways. For example, the first pivoting portion is a hook and the second pivoting portion is a cam pivotally coupled to the hook, or the first pivoting portion is a cam and the second pivoting portion is a hook pivotally latched to the cam. In other examples, the first pivoting portion and the second pivoting portion are a pair of hooks latched with each other, or the first snapping portion and the second snapping portion are a pair of hooks latched with each other. In other examples, the first snapping portion is a hook and the second snapping portion is a cam latched to the hook, or the first snapping portion is a cam and the second snapping portion is a hook latched to the cam.

[0009] In the present disclosure, the first pivoting portion is pivotally coupled to the second pivoting portion, so that the first bobbin and the second bobbin can be pivoted with respect to each other, and a single conductive wire may be wound around the first shaft and the second shaft and then the first bobbin and the second bobbin are pivotally rotated and separated from each other to facilitate manufacturers to install the inner core between the first bobbin and the second bobbin. Compared with the prior art, the present disclosure is able to complete the process of winding two connected bobbins by

a single conductive wire, and the modular bobbin of the present disclosure can be applied in the process of winding two or more bobbins.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010]

FIG. 1 is a perspective view of a magnetic module of a first preferred embodiment of the present disclosure;
FIG. 2 is an exploded view of a magnetic module of the first preferred embodiment of the present disclosure;
FIG. 3 is a perspective view of a modular bobbin of the first preferred embodiment of the present disclosure;
FIG. 4 is another perspective view of a modular bobbin of the first preferred embodiment of the present disclosure;
FIG. 5 is a sectional view of a modular bobbin of the first preferred embodiment of the present disclosure;
FIG. 6 is a schematic view of winding a modular bobbin of the first preferred embodiment of the present disclosure;
FIG. 7 is another schematic view of winding a modular bobbin of the first preferred embodiment of the present disclosure;
FIG. 8 is another schematic view of winding a modular bobbin of the first preferred embodiment of the present disclosure;
FIG. 9 is an exploded view of a magnetic module of the first preferred embodiment of the present disclosure;
FIG. 10 is a sectional view of a magnetic module of the first preferred embodiment of the present disclosure;
FIG. 11 is a schematic view of a modular bobbin of a second preferred embodiment of the present disclosure;
FIG. 12 is a schematic view of a modular bobbin of a third preferred embodiment of the present disclosure;
FIG. 13 is a schematic view of a modular bobbin of a fourth preferred embodiment of the present disclosure; and
FIG. 14 is a schematic view of winding a modular bobbin of a fifth preferred embodiment of the present disclosure.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0011] The technical contents of the present disclosure will become apparent with the detailed description of preferred embodiments accompanied with the illustration of related drawings as follows. It is noteworthy that same numerals are used for representing same respective elements in the drawings.

[0012] With reference to FIG. 1 for a magnetic module of the first preferred embodiment of the present disclosure, the magnetic module comprises a modular bobbin 10, a conductive wire 300, and a core module 400.

[0013] In FIGS. 2 to 5, the modular bobbin 10 includes a first bobbin 100 and a second bobbin 200. In this preferred embodiment, the first bobbin 100 includes a first shaft 110 and a first flapper 120. The first shaft 110 is a hollow plastic column, and the first flapper 120 is radially extended from an end 111 of the first shaft 110. The first flapper 120 has a first pivoting portion 130 and a first snapping portion 140 disposed on two opposite sides of the end 111 of the first shaft 110 respectively. In this preferred embodiment, the first pivoting portion 130 is a hook, and the first snapping portion 140 is a cam, but the present disclosure is not limited to such arrangements only. A first wire crossing slot 121 is formed at an edge of the first flapper 120 and disposed adjacent to the first pivoting portion 130.

[0014] In this preferred embodiment, the second bobbin 200 includes a second shaft 210 and a second flapper 220. The second shaft 210 is a plastic hollow column, and the second shaft 210 and the first shaft 110 are coaxially installed, and the second flapper 220 is radially extended from an end 211 of the second shaft 210. A second pivoting portion 230 and a second snapping portion 240 are disposed at the second flapper 220 and arranged on two opposite sides of the end 211 of the second shaft 210 respectively. In this preferred embodiment, the second pivoting portion 230 is a cam pivotally coupled to the first pivoting portion 130, and the second snapping portion 240 is a hook latched to the first snapping portion 140, but the present disclosure is not limited to such arrangements only. An edge of the second flapper 220 has a second wire crossing slot 221 disposed adjacent to the second pivoting portion 230, and the first wire crossing slot 121 is formed at a position corresponsive to the position of the second wire crossing slot 221.

[0015] In FIGS. 6 to 8, the conductive wire 300 includes at least one wire crossing section 301, a first winding section 310 and a second winding section 320 extended from both ends of the wire crossing section 301 respectively and wound around the first shaft 110 and the second shaft 210 respectively, and the wire crossing section 301 is disposed between the first flapper 120 and the second flapper 220, and both ends of the wire crossing section 301 are contained in the first wire crossing slot 121 and the second wire crossing slot 221 respectively, and the wire crossing section 301 is disposed adjacent to the first pivoting portion 130 and the second pivoting portion 230. This preferred embodiment comprises a plurality of wire crossing sections 301, a first winding section 310 and a second winding section 320, and the first winding section 310 and the second winding section 320 are arranged alternately with each other and each wire crossing section 301 is coupled between the adjacent first winding section 310 and second winding section 320, so that the conductive wire 300 can be wound around the

first winding section 310 and the second winding section 320 in a multi-layer manner.

[0016] In FIGS. 9 and 10, the core module 400 includes an inner core 401 and two outer cores 410/420. The inner core 401 is an iron member clamped between the first bobbin 100 and the second bobbin 200 and preferably clamped between the first flapper 120 and the second flapper 220. In this preferred embodiment, the inner core 401 preferably includes a protruding core rod 402, and the core rod 402 is passed into the first shaft 110 (In other preferred embodiments, the core rod 402 is passed into the second shaft 210).

[0017] Each outer core 410/420 is an iron member, and two outer cores 410/420 are installed at the other end of the first shaft 110 and the other end of the second shaft 210 respectively. Each outer core 410/420 includes a protruding core rod 411/421, and the two core rods 411/421 are passed into the first shaft 110 and the second shaft 210 respectively.

[0018] In the present disclosure, the first pivoting portion 130 is pivotally coupled to the second pivoting portion 230, so that the first bobbin 100 and the second bobbin 200 can be pivoted with respect to each other, and a single conductive wire 300 can be wound around the first shaft 110 and the second shaft 210, and then the first bobbin 100 and the second bobbin 200 can be rotated and separated to facilitate manufacturers to install the inner core 401 between the first bobbin 100 and the second bobbin 200. More specifically, the second pivoting portion 230 is detachably and pivotally coupled to the first pivoting portion 130, and/or the second snapping portion 240 is detachably latched to the first snapping portion 140, so that the first bobbin 100 and the second bobbin 200 can be pivoted and rotated by the first pivoting portion 130 and the second pivoting portion 230 to separate the second snapping portion 240 from the first snapping portion 140, and/or the first bobbin 100 and the second bobbin 200 can be pivoted and rotated by the first snapping portion 140 and the second snapping portion 240 to separate the second pivoting portion 230 from the first pivoting portion 130. Compared with the prior art, the present disclosure can complete the process of winding two connected bobbins by a single conductive wire 300, and the modular bobbin 10 of the present disclosure may be applied in a single-wire winding process of two or more connected bobbins.

[0019] With reference to FIG. 11 for a modular bobbin of the second preferred embodiment of the present disclosure, the modular bobbin 10 is applied in the magnetic module of the first preferred embodiment and its structure is substantially the same as that of the first preferred embodiment. The difference between the modular bobbin 10 of this preferred embodiment and the modular bobbin 10 of the first preferred embodiment resides on that the first snapping portion 140 is a hook, and the second snapping portion 240 is a cam snapped to the first snapping portion 140. In addition, the first pivoting portion 130 is a shaft hole, and the second pivoting portion 230 is a cam pivotally coupled to the first pivoting portion 130.

[0020] With reference to FIG. 12 for a modular bobbin of the third preferred embodiment of the present disclosure, the modular bobbin 10 is applied in the magnetic module of the first preferred embodiment and its structure is substantially the same as that of the first preferred embodiment. The difference between the modular bobbin 10 of this preferred embodiment and the modular bobbin 10 of the first preferred embodiment resides on that the first pivoting portion 130 is a cam, and the second pivoting portion 230 is a hook pivotally coupled to the first pivoting portion 130, and the first snapping portion 140 is a hook, and the second snapping portion 240 is a cam snapped to the first snapping portion 140.

[0021] With reference to FIG. 13 for a modular bobbin of the fourth preferred embodiment of the present disclosure, the modular bobbin 10 is applied in the magnetic module of the first preferred embodiment and its structure is substantially the same as that of the first preferred embodiment. The difference between the modular bobbin 10 of this preferred embodiment and the modular bobbin 10 of the first preferred embodiment resides on that the first snapping portion 140 is a hook, and the second snapping portion 240 is a cam snapped to the first snapping portion 140.

[0022] With reference to FIG. 14 for a modular bobbin of the fifth preferred embodiment of the present disclosure, the modular bobbin 10 is applied in the magnetic module of the first preferred embodiment and its structure is substantially the same as that of the first preferred embodiment. The difference between the modular bobbin 10 of this preferred embodiment and the modular bobbin 10 of the first preferred embodiment resides on that the first snapping portion 140 and the second snapping portion 240 are a pair of hooks latched to one another.

Claims

1. A modular bobbin 10, comprising:

a first bobbin 100, including a first shaft 110, and a first pivoting portion 130 and a first snapping portion 140 disposed at an end 111 of the first shaft 110, and the first pivoting portion 130 and the first snapping portion 140 being arranged on opposite sides of the end 111 of the first shaft 110 respectively; and

a second bobbin 200, including a second shaft 210 coaxially installed with the first shaft 110, and a second pivoting portion 230 and a second snapping portion 240 disposed at an end 211 of the second shaft 210 and arranged at two opposite sides of the end 211 of the second shaft 210 respectively, and the second pivoting portion 230 being pivotally coupled to the first pivoting portion 130, and the second snapping portion 240 being detachably latched to the first

snapping portion 140, so that the first bobbin 100 and the second bobbin 200 may be pivoted and rotated by the first pivoting portion 130 and the second pivoting portion 230 to separate the second snapping portion 240 from the first snapping portion 140.

2. The modular bobbin 10 of claim 1, wherein the second pivoting portion 230 is detachably and pivotally coupled to the first pivoting portion 130, such that the first bobbin 100 and the second bobbin 200 may be rotated by using the first snapping portion 140 and the second snapping portion 240 as a pivot to separate the second pivoting portion 230 from the first pivoting portion 130.

3. The modular bobbin 10 of claim 1, wherein the end 111 of the first shaft 110 has a first flapper 120 and the first pivoting portion 130 is disposed at the first flapper 120, and the end 211 of the second shaft 210 has a second flapper 220, and the second pivoting portion 230 is disposed at the second flapper 220, and the first flapper 120 has a first wire crossing slot 121 formed at an edge of the first flapper 120, and the second flapper 220 has a second wire crossing slot 221 formed at an edge of the second flapper 220.

4. The modular bobbin 10 of claim 3, wherein the first wire crossing slot 121 is formed at a position corresponsive to the position of the second wire crossing slot 221, and the first wire crossing slot 121 and the first pivoting portion 130 are disposed adjacent to each other, and the second wire crossing slot 221 and the second pivoting portion 230 are disposed adjacent to each other.

5. The modular bobbin 10 of claim 1 or 2, wherein the first pivoting portion 130 is a hook, and the second pivoting portion 230 is a cam pivotally coupled to the hook.

6. The modular bobbin 10 of claim 1 or 2, wherein the first pivoting portion 130 is a cam, and the second pivoting portion 230 is a hook pivotally coupled to the cam.

7. The modular bobbin 10 of claim 1 or 2, wherein the first pivoting portion 130 and the second pivoting portion 230 are a pair of hooks latched to each other.

8. The modular bobbin 10 of claim 1 or 2, wherein the first snapping portion 140 and the second snapping portion 240 are a pair of hooks latched to each other.

9. The modular bobbin 10 of claim 1 or 2, wherein the first snapping portion 140 is a hook, and the second snapping portion 240 is a cam latched to the hook.

10. The modular bobbin 10 of claim 1 or 2, wherein the first snapping portion 140 is a cam, and the second snapping portion 240 is a hook latched to the cam.

11. A magnetic module, comprising:

a modular bobbin 10, including a first bobbin 100 and a second bobbin 200, and the first bobbin 100 including a first shaft 110, and an end 111 of the first shaft 110 having a first pivoting portion 130 and a first snapping portion 140, and the first pivoting portion 130 and
the first snapping portion 140 being disposed on two opposite sides of the end 111 of the first shaft 110, and the second bobbin 200 including a second shaft 210 coaxially installed with the first shaft 110, and an end 211 of the second shaft 210 having a second pivoting portion 230 and a second snapping portion 240 disposed on two opposite sides of the end 211 of the second shaft 210 respectively, and the second pivoting portion 230 being pivotally coupled to the first pivoting portion 130, and the second snapping portion 240 being separately latched to the first snapping portion 140, so that the first bobbin 100 and the second bobbin 200 may be pivoted and rotated by the first pivoting portion 130 and the second pivoting portion 230 to separate the second snapping portion 240 from the first snapping portion 140;
a core module 400, including an inner core 401, and the inner core 401 being situated between the first bobbin 100 and the second bobbin 200 when the second snapping portion 240 is separated from the first snapping portion 140; and
a conductive wire 300, wound around the first shaft 110 and the second shaft 210.

12. The modular bobbin 10 of claim 11, wherein the second pivoting portion 230 is detachably and pivotally coupled to the first pivoting portion 130, so that the first bobbin 100 and the second bobbin 200 may be pivoted and rotated by the first snapping portion 140 and the second snapping portion 240 to separate the second pivoting portion 230 from the first pivoting portion 130.

13. The modular bobbin 10 of claim 11 or 12, wherein the end 111 of the first shaft 110 has a first flapper 120 and the first pivoting portion 130 is disposed at the first flapper 120, and the end 211 of the second shaft 210 has a second flapper 220, and the second pivoting portion 230 is disposed at the second flapper 220, and the inner core 401 is installed between the first flapper 120 and the second flapper 220, and the modular bobbin 10 of claim 15, wherein the first flapper 120 has a first wire crossing slot 121 formed at an edge of the first flapper 120, and the second flap-

per 220 has a first wire crossing slot 221 formed at an edge of the first wire crossing slot 221.

14. The modular bobbin 10 of claim 11, wherein the conductive wire 300 includes a wire crossing section 301, and a first winding section 310 and a second winding section 320 are extended from both ends of the wire crossing section 301 respectively, the first winding section 310 and the second winding section 320 are wound around the first shaft 110 and the second shaft 210 respectively, and the wire crossing section 301 is disposed between the first flapper 120 and the second flapper 220, and both ends of the wire crossing section 301 are contained in the first wire crossing slot 121 and the second wire crossing slot 221 respectively.

15. The modular bobbin 10 of claim 11, wherein the first wire crossing slot 121 is formed at a position corresponsive to the position of the second wire crossing slot 221, and the first wire crossing slot 121 and the first pivoting portion 130 are disposed adjacent to each other, and the second wire crossing slot 221 and the second pivoting portion 230 are disposed adjacent to each other.

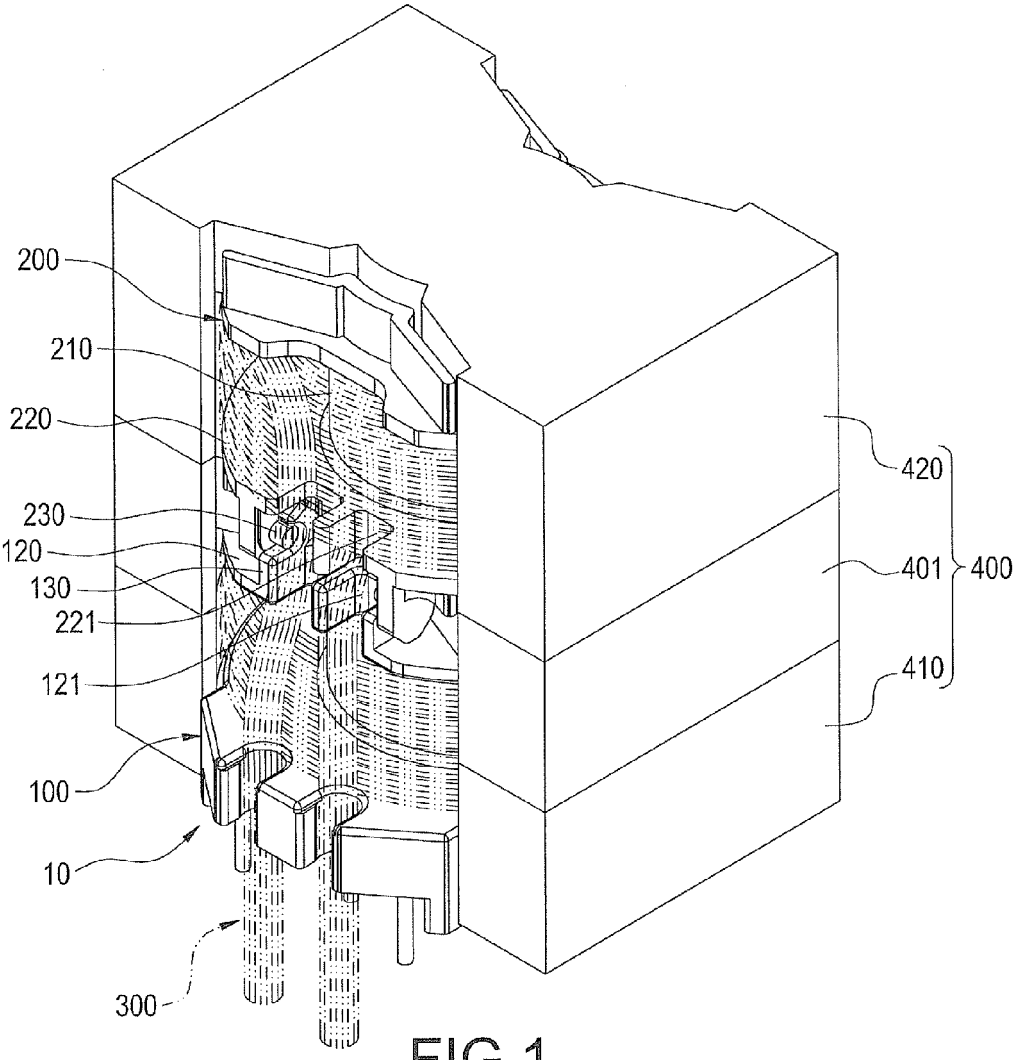


FIG.1

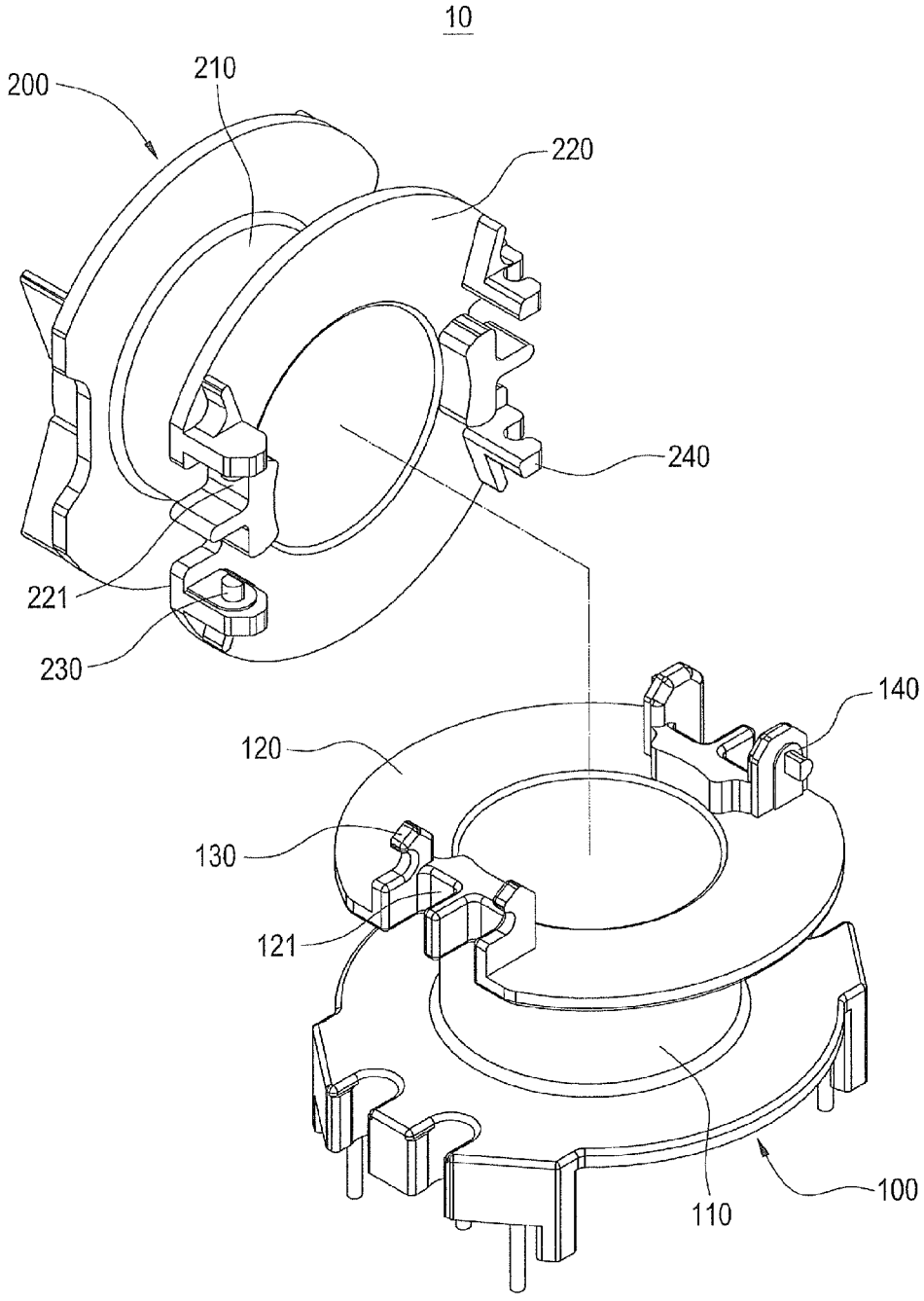


FIG.2

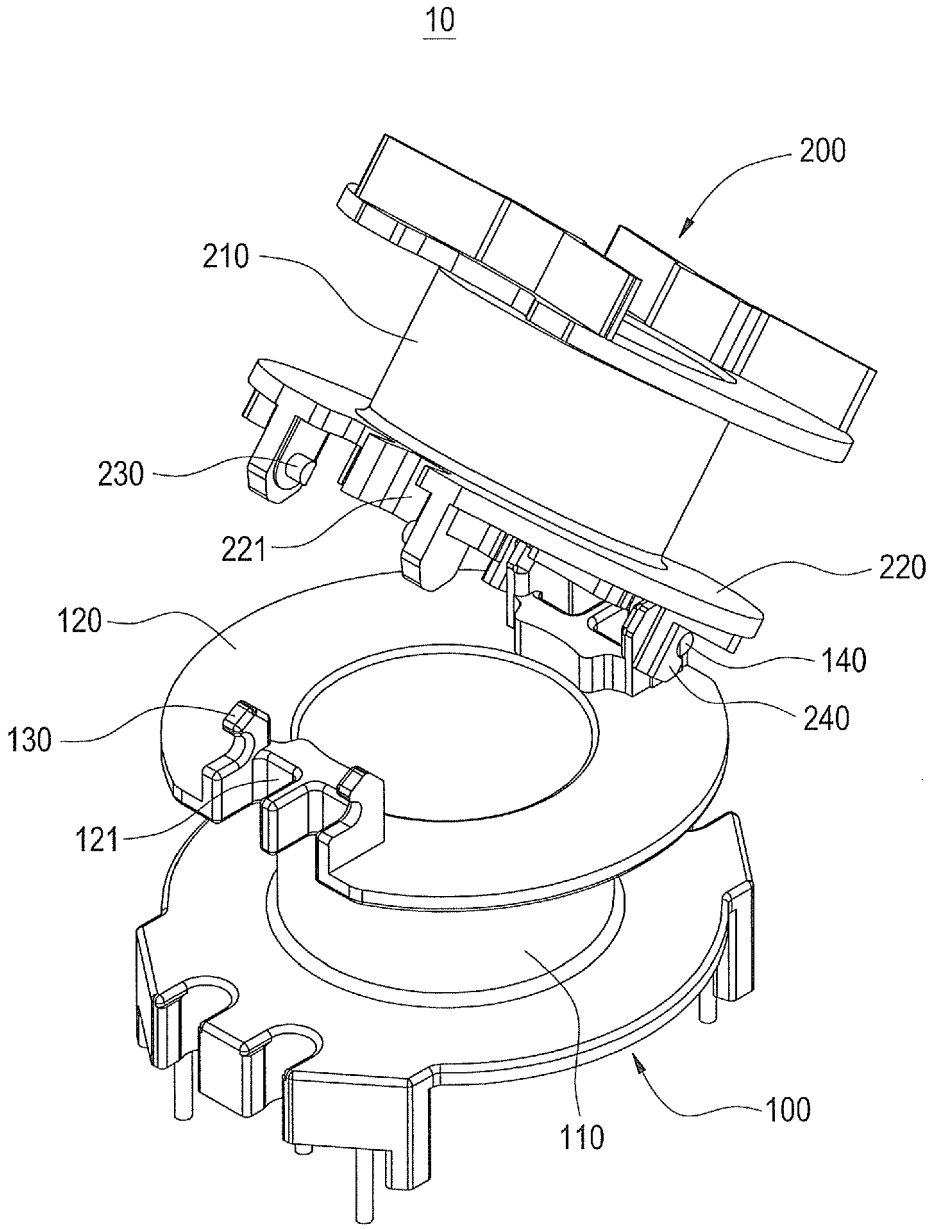


FIG.3

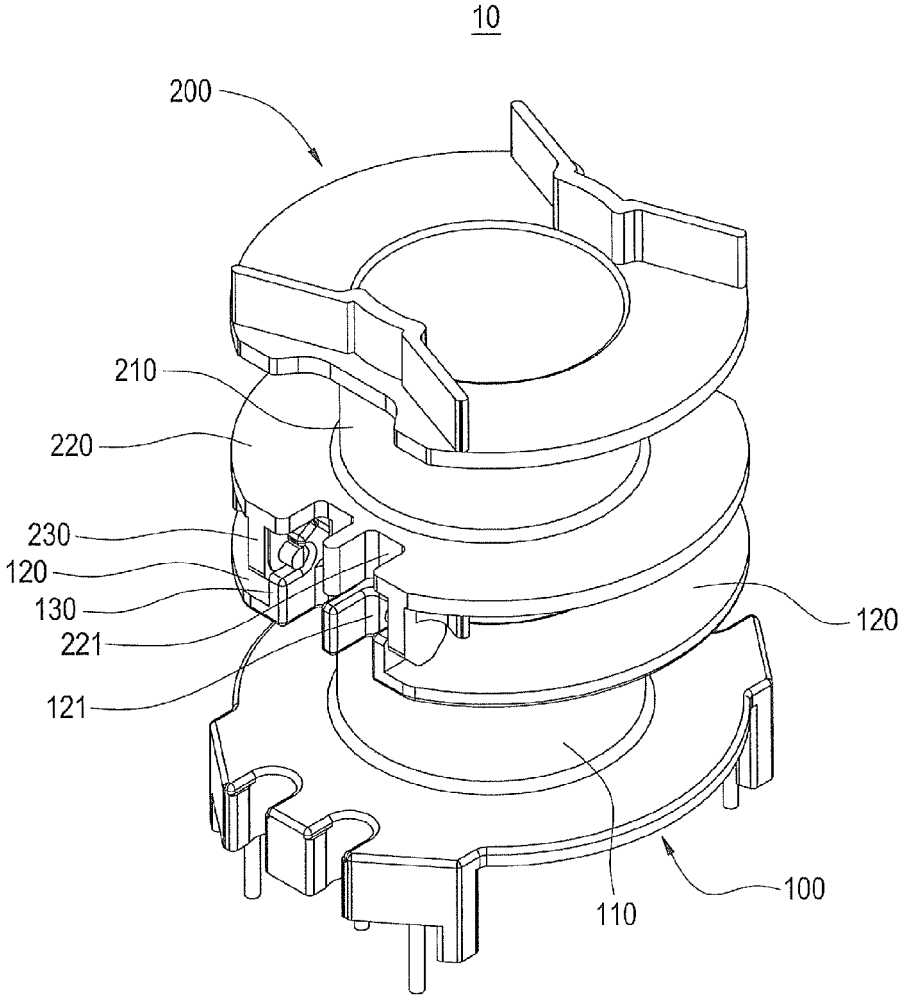


FIG.4

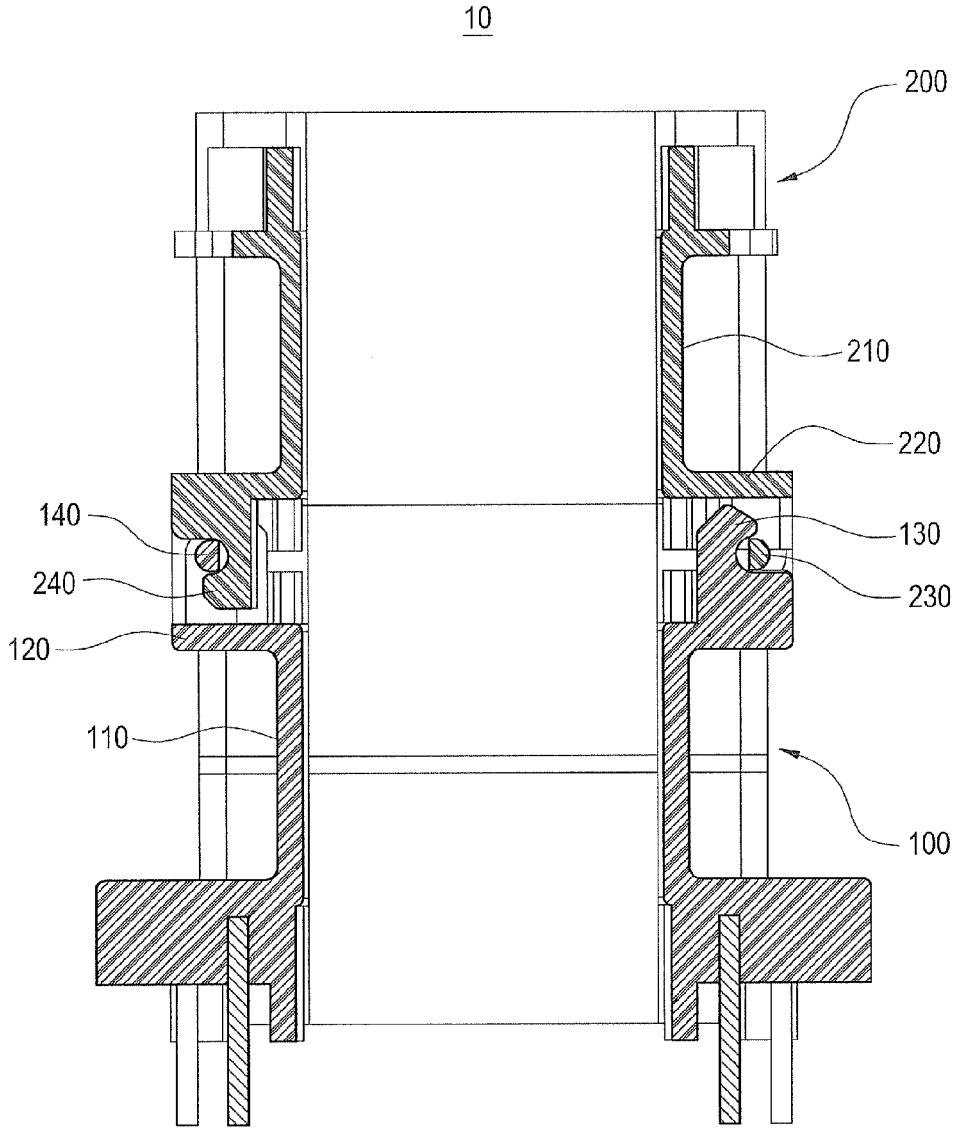


FIG.5

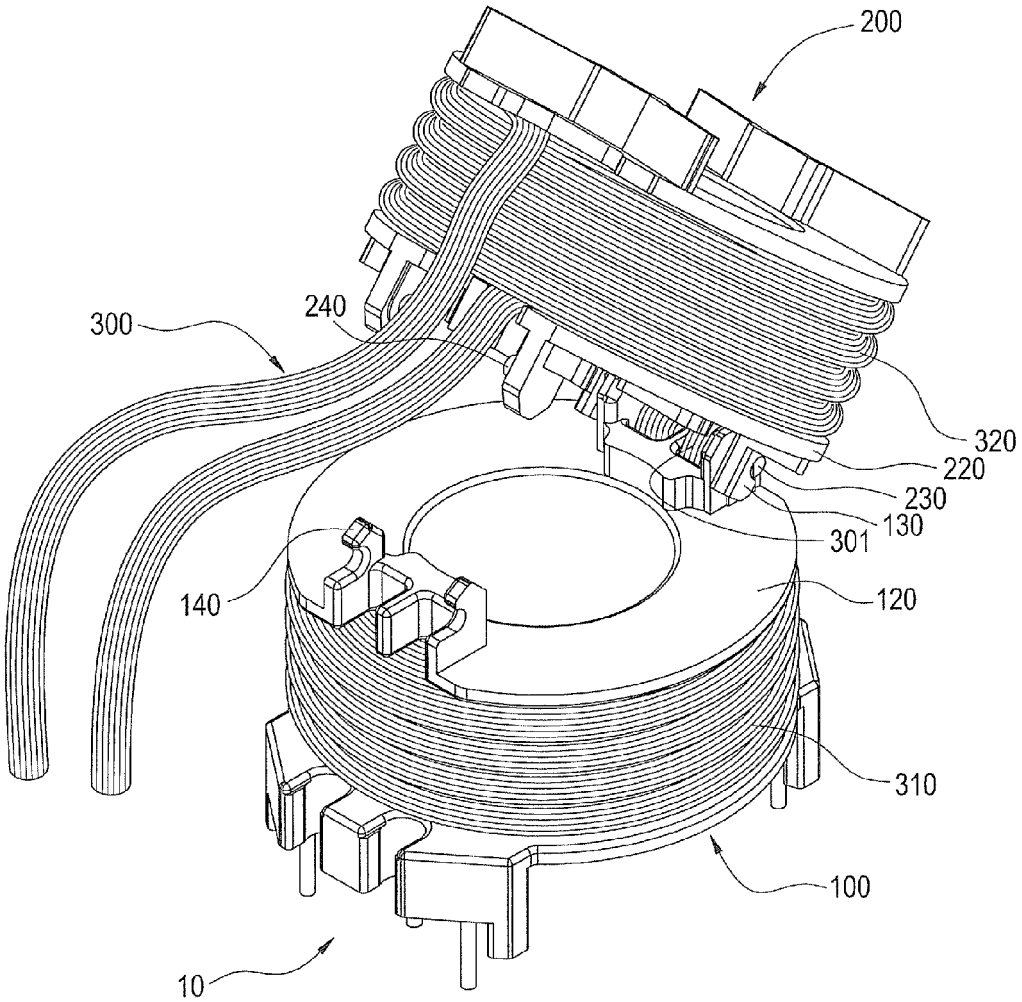


FIG.6

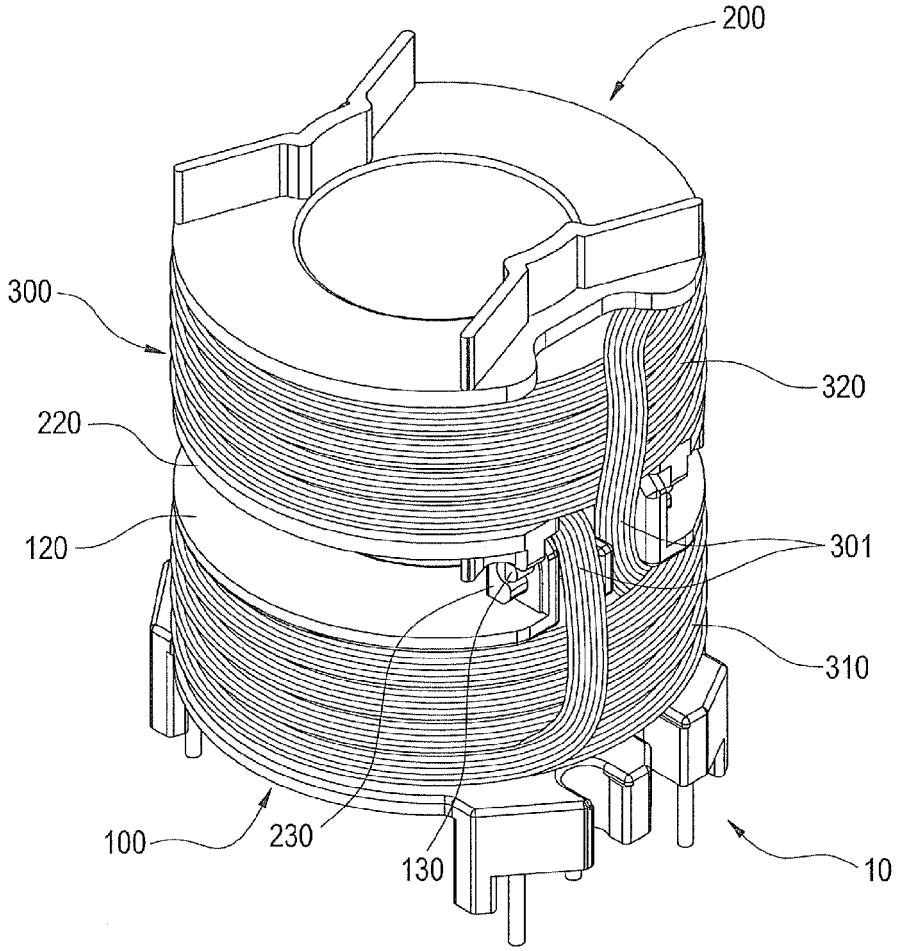


FIG.7

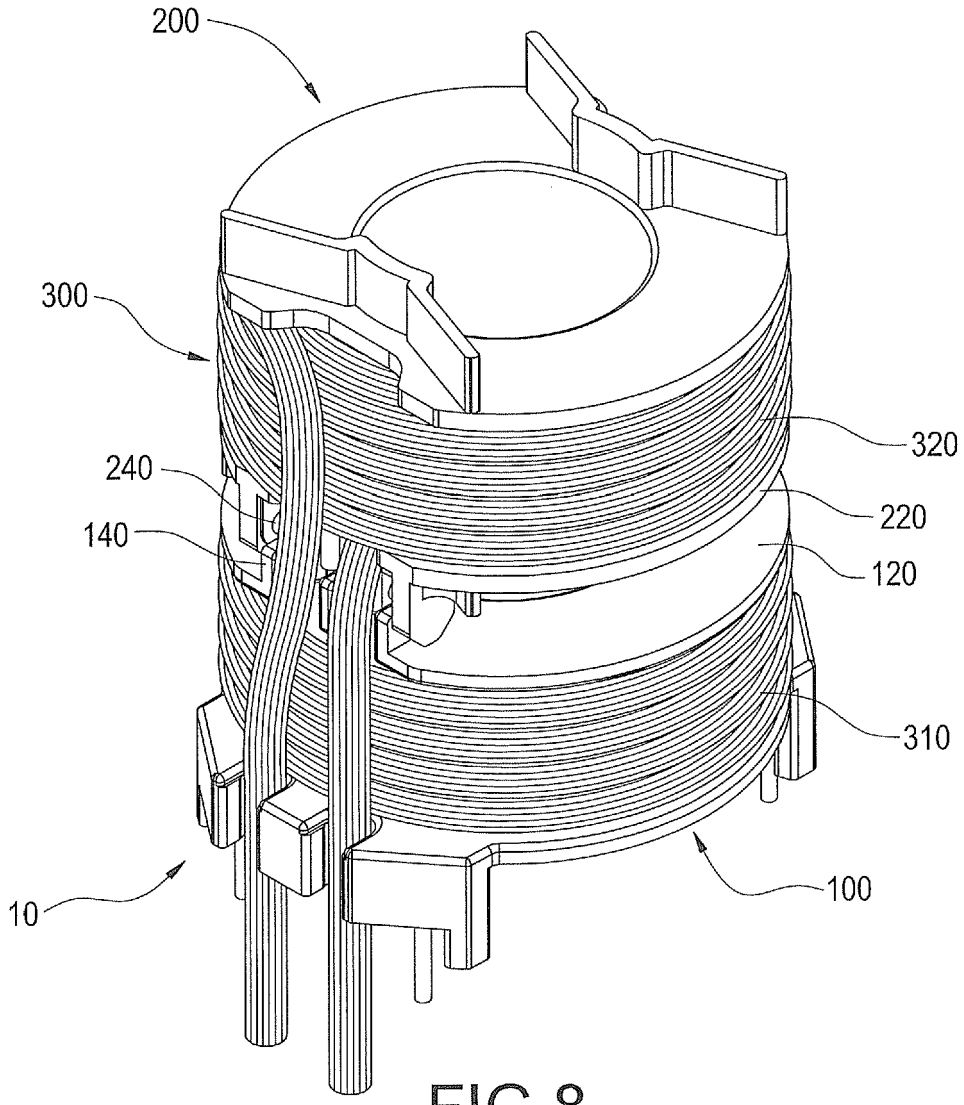


FIG.8

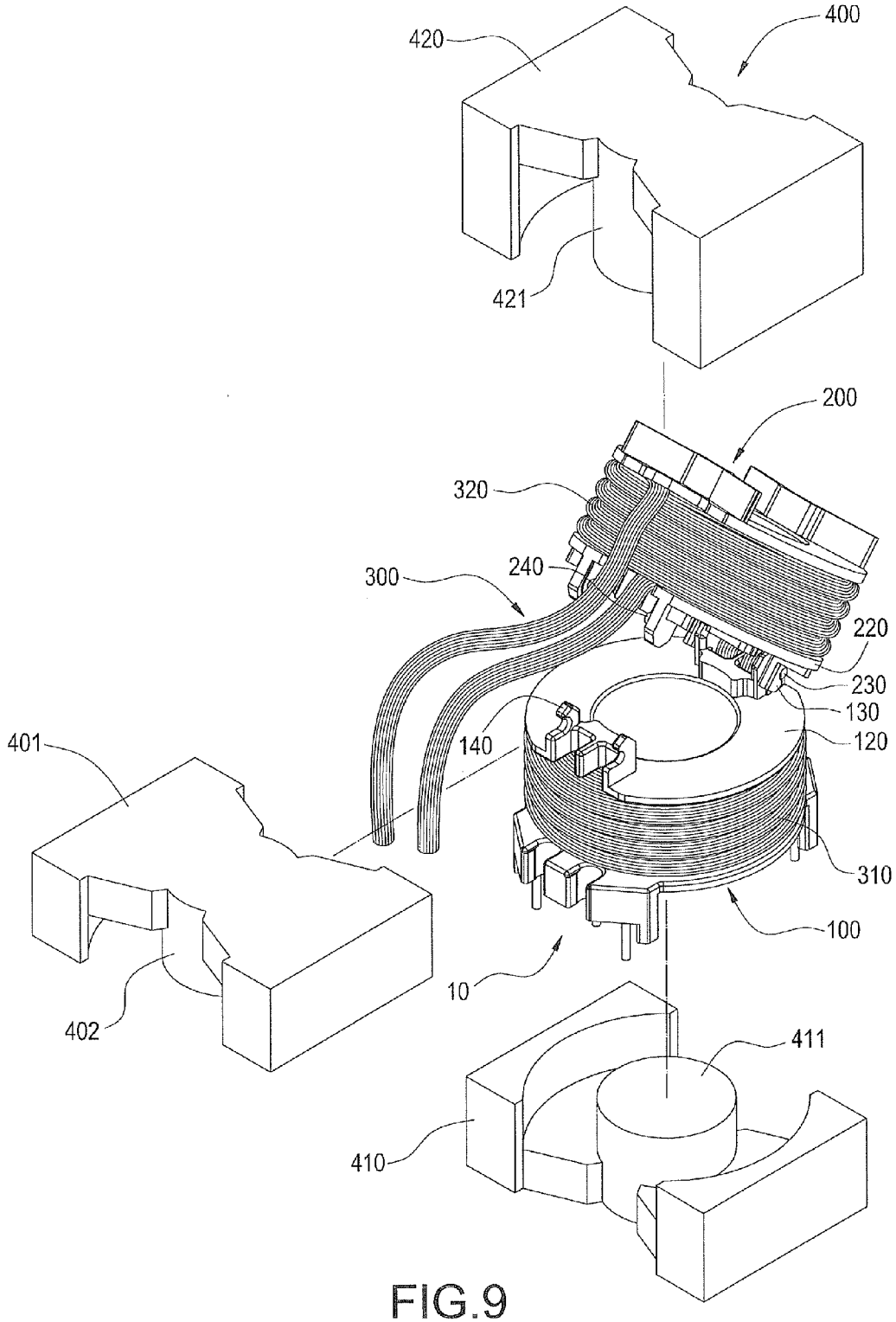

420
400
421
200
320
240
300
220
230
130
120
140
401
310
100
10
402
411
410

FIG.9

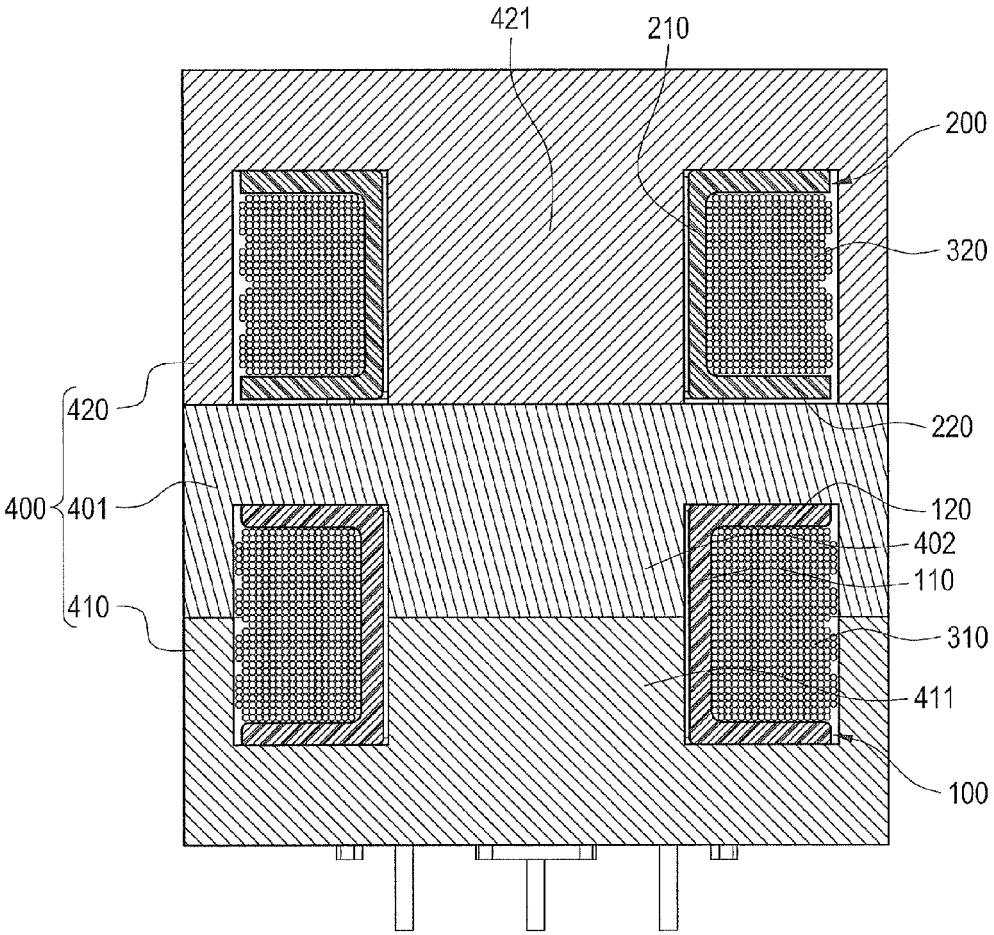


FIG.10

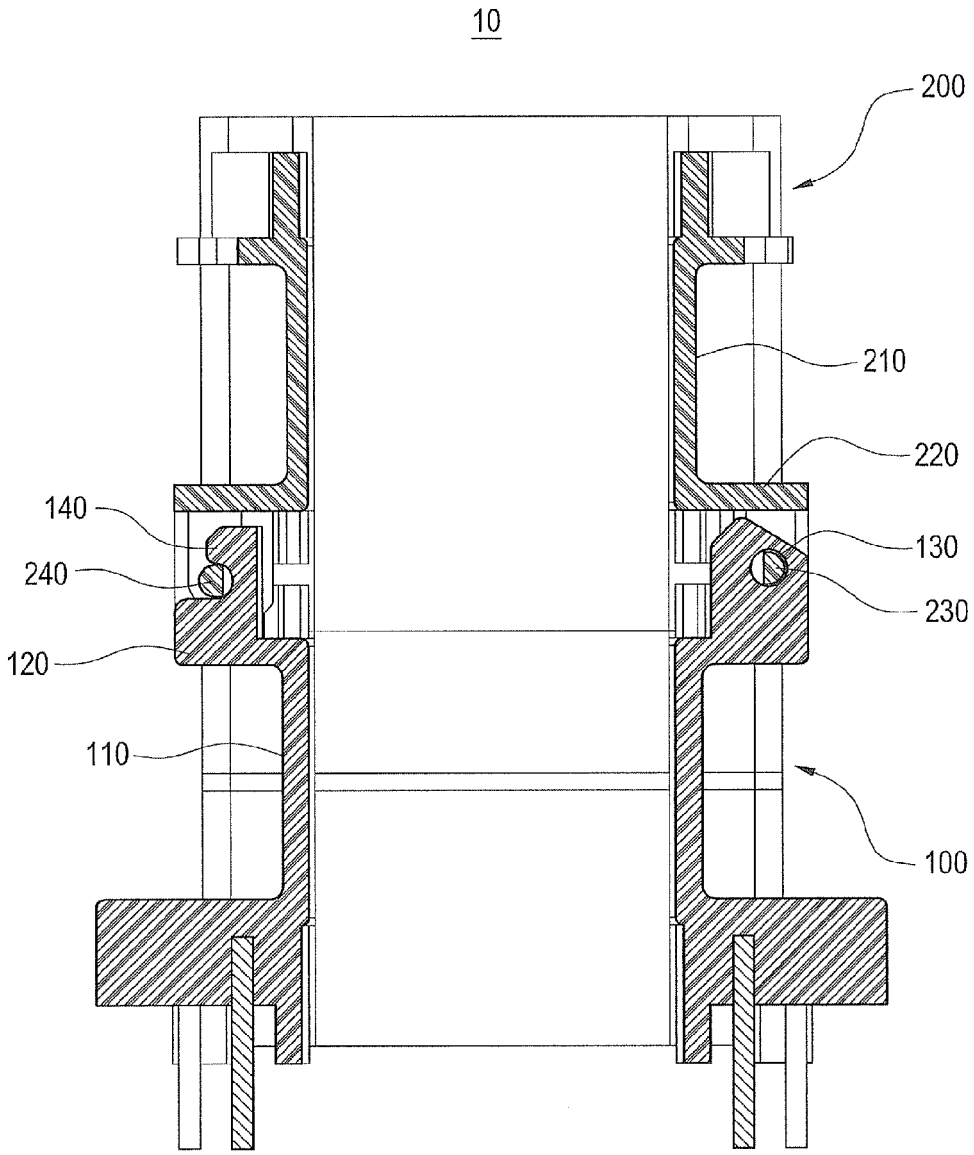


FIG.11

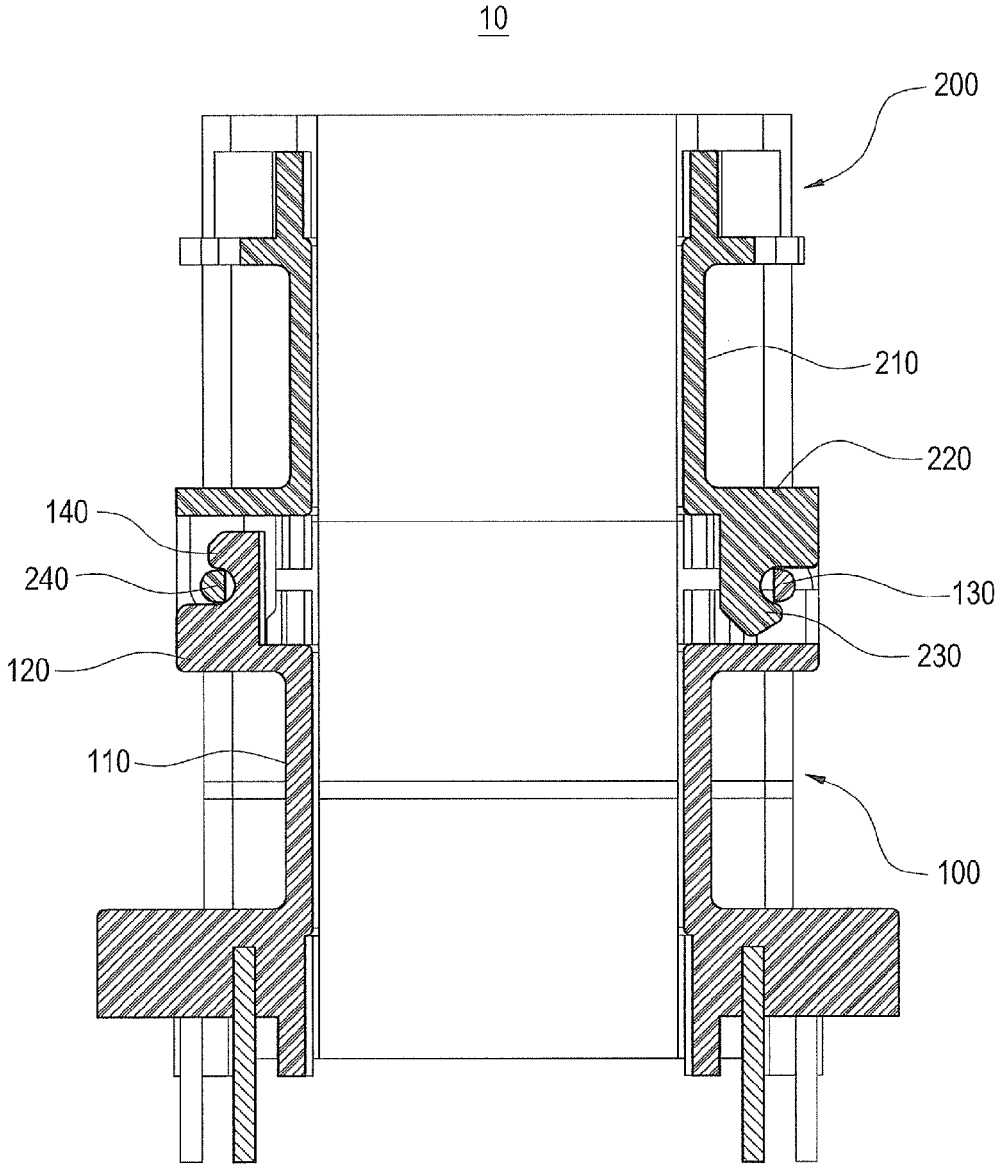


FIG.12

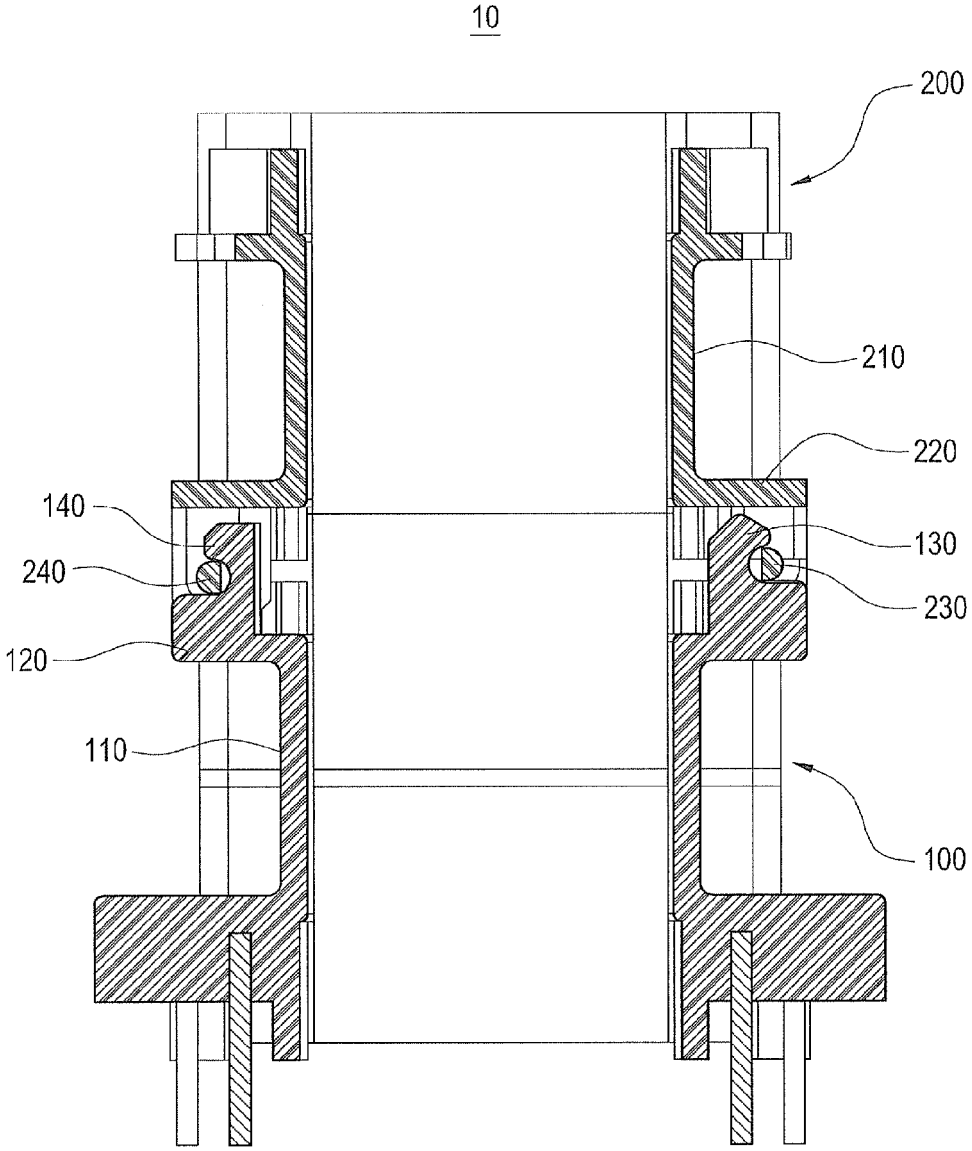


FIG.13

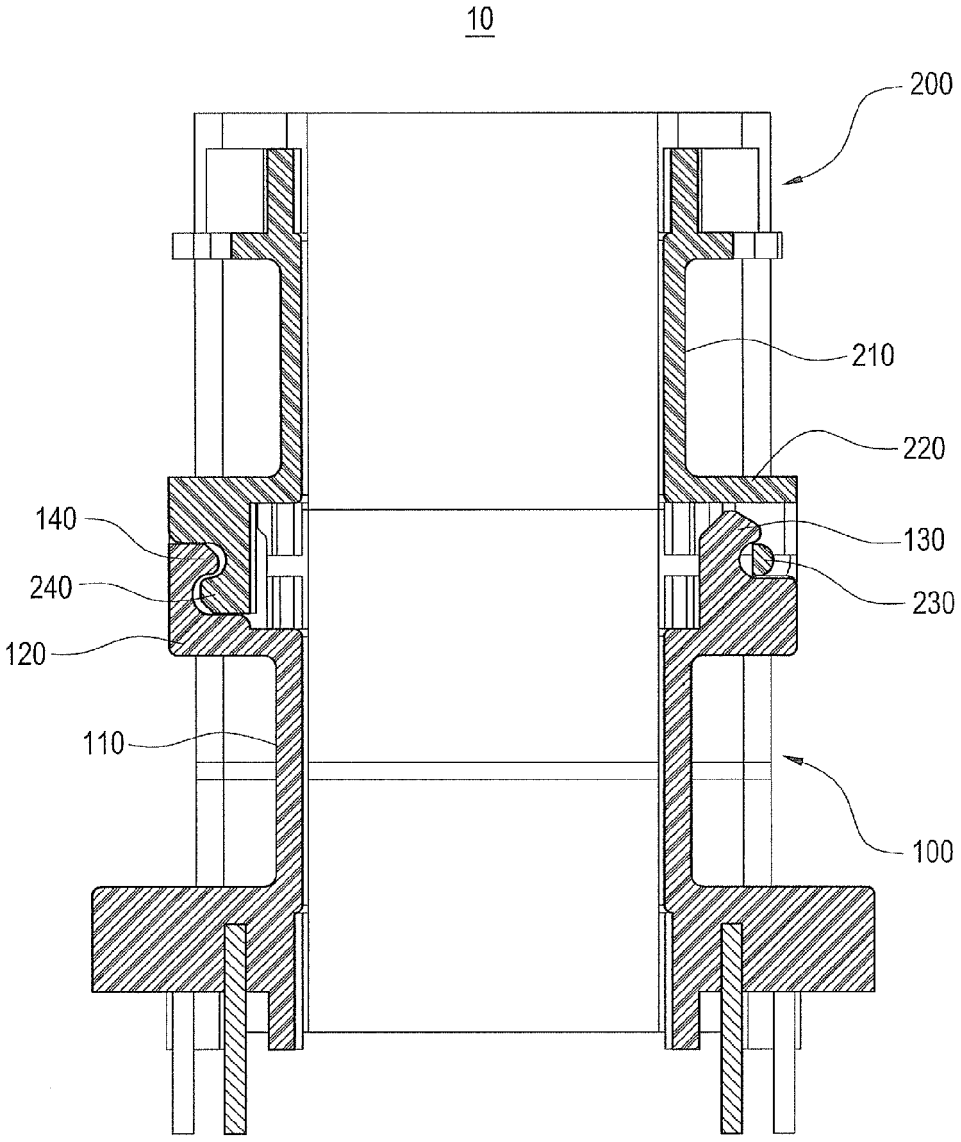


FIG.14

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European Patent Office
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EUROPEAN SEARCH REPORT

Application Number
EP 14 19 3421

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 2011/025304 A1 (LINT JAMES DOUGLAS [US] ET AL) 3 February 2011 (2011-02-03) * paragraphs [0012], [0077], [0095], [0107], [0112] * * figures 2, 5 *	1-15	INV. H01F5/02
A	US 3 843 946 A (ANDERSON D ET AL) 22 October 1974 (1974-10-22) * column 1, lines 3, 4 and 23 - 27 * * column 2, lines 15 - 19 and 35 - 38 * * column 3, line 45 - column 4, line 4 * * figure 9 *	1-15	
A	US 4 103 268 A (ANDERS RAYMOND H ET AL) 25 July 1978 (1978-07-25) * column 1, lines 6 - 9 * * column 2, lines 58 - 61 * * column 3, lines 9 - 25 and 43 - 62 * * figures 1 - 6 *	1-15	
			TECHNICAL FIELDS SEARCHED (IPC) H01F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	27 November 2015	Van den Berg, G

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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A : technological background
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E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 14 19 3421

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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