

March 10, 1970

TOSHIRO MATSUURA ET AL

3,500,274

VARIABLE INDUCTOR

Filed Nov. 4, 1968

2 Sheets-Sheet 1

FIG. 1

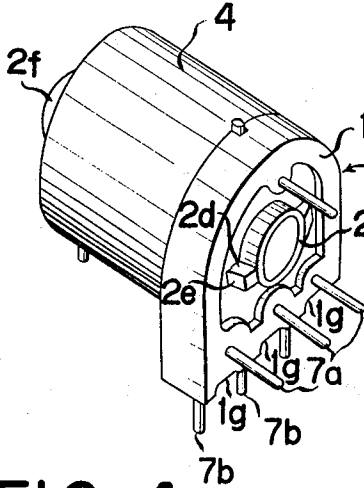


FIG. 2

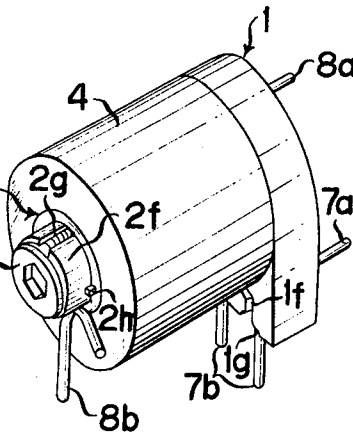


FIG. 4

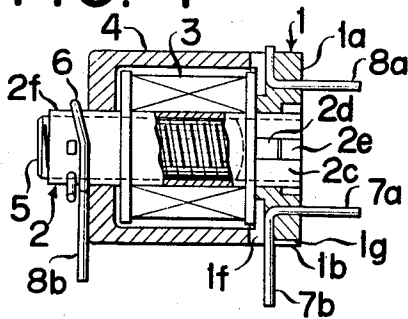


FIG. 5

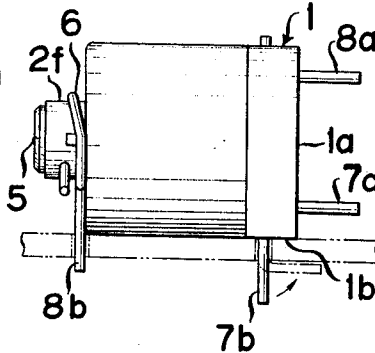
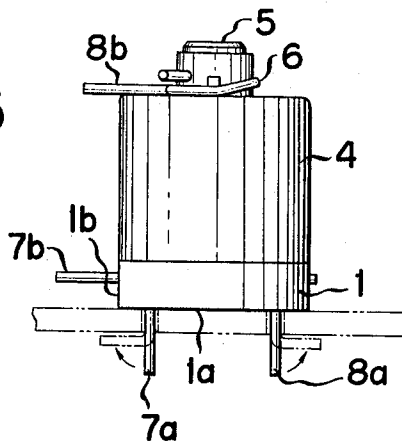


FIG. 6



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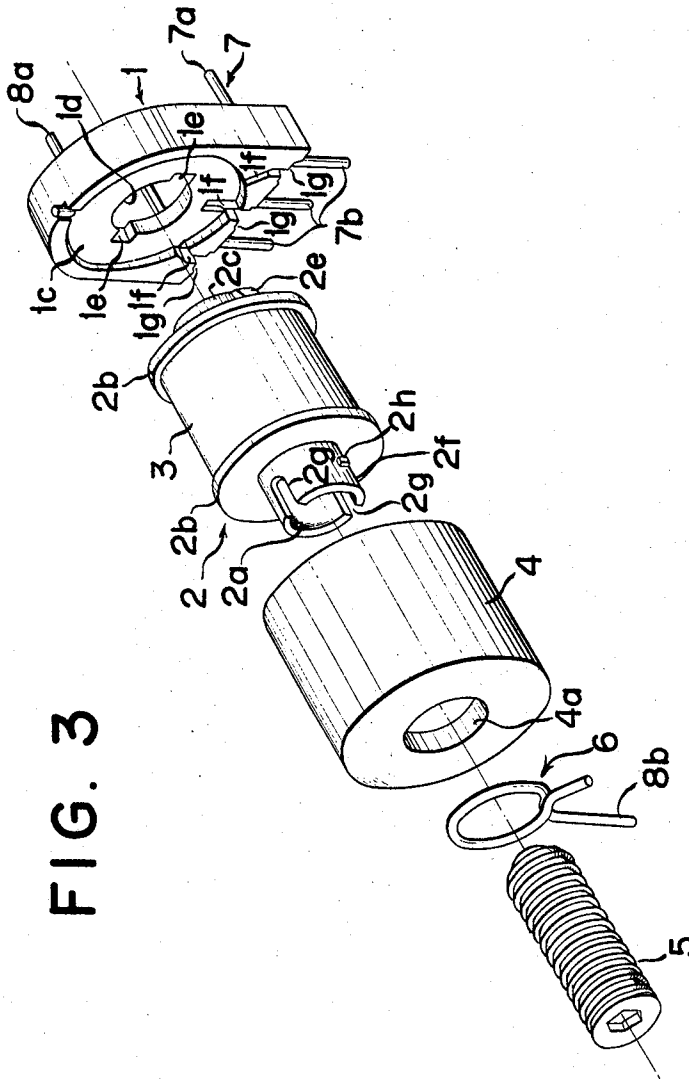
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VARIABLE INDUCTOR

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7 Claims

ABSTRACT OF THE DISCLOSURE

A variable inductor involves a base having two mutually perpendicular faces, a plurality of L-shaped terminal members having their bent portions moulded in said base, each member having its legs projecting from said faces respectively, and two auxiliary legs disposed in a direction parallel to said first mentioned legs, the respective groups of which are positioned on each of said perpendicular faces, so that all said mutually parallel legs fixedly secure said base on a fitting panel.

This invention relates to a variable inductor to be mounted on a fitting panel such as a print wiring panel and specifically to a variable inductor capable of being attached to said fitting panel on either of two available sides which is selected when an electronic or electric apparatus including said inductor is fabricated.

The prior art variable inductors have been mounted on the fitting panel in only one plane. Therefore, in the case where an electronic apparatus such as an electronic musical instrument was to be manufactured under rigid design conditions and particularly after said inductor was mounted on the print wiring panel of said apparatus, difficulties often resulted in adjusting the position of the magnetic core of the inductor relative to the coil so as to vary its capacity as desired.

An object of this invention is to provide a variable inductor capable of being mounted on a fitting panel so as easily to adjust the position of its magnetic core relative to the coil, even if an electronic or electric apparatus involving said inductor is to be assembled under rigid design conditions.

Further objects and features of this invention will be clarified from the following description of the embodiment of the present invention taken with the accompanying drawings, in which:

FIG. 1 is a perspective view of a variable inductor embodying this invention;

FIG. 2 is a perspective back view of the variable inductor of FIG. 1;

FIG. 3 is a perspective view of the detached parts of the variable inductor of FIG. 1;

FIG. 4 is an elevational cross-section of the variable inductor of FIG. 1;

FIG. 5 is an elevational side view of the variable inductor of FIG. 1, where it is fitted to a print wiring panel on one side; and

FIG. 6 is an elevational side view of the variable inductor of FIG. 1, where it is fitted to the print wiring panel on the other side.

A variable inductor embodying this invention is shown in the drawings. Said variable inductor comprises an insulating base 1 preferably made of rigid synthetic resin such as phenolic resins, an insulating bobbin 2 preferably made of elastic synthetic resins such as polyethylene and polyamide, said bobbin having a through bore 2a formed along the central axis thereof, an induction wire 3 coiled around said bobbin, a cup-shaped magnetic core 4 surrounding said induction coil 3 and having a through bore 4a coaxially positioned with the through bore 2a of the

bobbin, and a bar-shaped magnetic core 5 having its periphery screw-threaded so as to be adjustably fitted into the bobbin bore 2a. Said variable inductor further involves a clip 6 made of steel-wiring formed into a loop.

Said bobbin 2 is provided with a pair of mutually spaced flanges 2b, between which there is disposed said induction coil 3 and which are tightly fitted to said cup-shaped magnetic core 4. Said bobbin is further provided with a cylindrical end portion 2c having two protrusions 2d formed on the periphery of the end portion in a manner to extend along the central axis of the bobbin from the end to the flange 2b and face each other exactly across the diameter of the end portion. On the protrusions 2d are integrally formed outwardly tapering wedge-shaped interlocking members 2e at the outermost end.

The other cylindrical end portion 2f of said bobbin 2 projects from the other flange. Said end portion 2f has a pair of slits 2g formed on the periphery thereof in a manner to extend along the central axis of the bobbin from the end toward the flange and be mutually spaced by half the circumference. Said end portion 2f further includes a rest 2h disposed on the periphery thereof in a plane perpendicular to that in which the opposite slits 2g are arranged.

A plurality of, for example, three L-shaped terminal members 7 are provided with bent portions moulded in the afore-mentioned base 1. Each terminal member has two legs vertically projecting from two mutually perpendicular faces 1a and 1b of said base respectively. Said base may be formed into a substantial shoe heel-shape involving said perpendicular faces 1a and 1b. The legs 7a grouped on the first face 1a are arranged parallel to each other along the edge of said base at which said faces intersect each other, and the other grouped legs 7b on the second face 1b are similarly arranged.

Said base includes a circular shallow cave 1c, the opening of which is disposed opposite to the first face 1a. Into said shallow cave 1c is closely fitted the flange 2b adjacent to the end portion 2c. The bottom of the shallow cave 1c is perforated with a through bore 1d for receiving the cylindrical end portion 2c of the bobbin and two grooves 1e for guiding the protrusions 2d, said through bore and grooves being positioned at the central part of the bottom of said cave 1c.

Three narrow grooves 1f are formed between the circular inner wall of said shallow cave 1c and the second face 1b in a manner to extend along the face opposite to the first face from the bottoms of the legs 7b toward the central axis of the base 1. Said narrow grooves 1f communicate with three shallow grooves 1g respectively, said shallow grooves 1g being formed on the second face 1b extending in a direction parallel to the legs 7a.

The variable inductor further involves two auxiliary legs 8a and 8b, one of which projects from the first face 1a in a direction parallel to the legs 7a, and the other consists of one end portion of the clip 6 outwardly extending from the loop portion and arranged parallel to the legs 7b when the variable inductor is assembled.

In assembling said variable inductor, the end portion 2c is first received in the through bore 1d and the protrusions 2d are guided into the grooves 1e by forcefully passing the wedge-shaped members 2e through said grooves due to the elastic deformation of said end portion, with the result that said wedge-shaped members interlock with the inner edges of the base 1 adjacent to the grooves 1e so as to secure the bobbin to the base 1. In this case, one of the flanges 2b is fitted into the shallow cave 1c, and the lead wires of the above-mentioned induction coil are already introduced into the grooves 1f and 1g and connected to the terminal members 7.

Furthermore, the end portions of the induction wire and intermediate tap lead wire are preferably wound

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around and soldered on the base portions of the above-mentioned legs except for those employed for mounting the variable inductor body on the fitting panel, so as to avoid the cutting of the induction wire which might otherwise occur when the latter legs are forcefully inserted, as is usually practised, into bores drilled through the fitting panel.

Secondly, the aforementioned cup-shaped magnetic core 4 is made to house the entire bobbin 2 by passing the other end portion 2f of said bobbin through the bore 4a of the core. After the entire bobbin 2 is housed, the clip 6 is fitted to the base of the projecting end portion 2f in a manner to be forcefully attached to the outer bottom surface of said core 4 by interlocking a part of said clip 6 with the rest 2h, so that the opening of said core 4 contacts the inside surface of the base 1. In this case, the other end portion of the clip preferably extends outwardly from the loop, so that when the clip is fitted to the end portion of said bobbin, the loop can be easily expanded by the deformation of said clip due to the finger-operation applied to both end portions.

Finally, the screw-threaded magnetic core 5 is inserted into the through bore 2a of the bobbin while moving it spirally. Where the diameter of said core 5 is made slightly larger than that of the through bore 2a of said bobbin, screw grooves will be forcefully cut in the inner wall of said through bore 2a by rotatingly inserting said core 5 into said bore 2a. Therefore it is unnecessary to cut screw threads in the inner wall in advance.

In this embodiment, the base 1 has two mutually perpendicular faces 1a and 1b, and two groups of legs including auxiliary legs 8a and 8b are respectively formed on each of said faces. Accordingly, the variable inductor can be mounted on a fitting panel 9 such as a print wiring panel on either of the two sides as illustrated in FIGS. 5 and 6, so as easily to adjust the position of its magnetic core 5 relative to the induction coil, even if an electronic or electric apparatus involving said inductor is to be assembled under rigid design conditions.

Furthermore, use of the wedge-shaped interlocking member 2e can reduce the time of assembling said variable inductor, because the bobbin can be rigidly set on the base only by forcefully pushing said interlocking members 2e through the grooves 1e. And the protrusions 2d disposed in said grooves 1e can prevent the bobbin from being loosened by rotating relative to the base 1 when the magnetic core 5 is adjustably screwed into the through bore 2a.

What is claimed is:

1. A variable inductor to be mounted on a fitting panel, comprising an insulating base having two mutually perpendicular faces, an insulating bobbin attached to said base, an induction wire coiled around said bobbin, an adjusting core movable relative to said induction coil, a plu-

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ality of L-shaped terminal members having their bent portions moulded in said base, each member having two legs projecting from said faces respectively, and two auxiliary legs disposed in a direction parallel to said first mentioned legs, the respective groups of which are positioned on each of said perpendicular faces, so that either one of said groups of legs involving said auxiliary legs is adapted to secure said base on said fitting panel rigidly.

2. A variable inductor claimed in claim 1 in which said bobbin has its one end portion provided with protrusions extending to the axial direction thereof, and said base is provided with a through bore and grooves so that said bobbin is set on said base by receiving the end portion in the through bore and guiding the protrusions into the grooves.

3. A variable inductor claimed in claim 2 in which an outwardly tapering wedge-shaped interlocking member is integrally formed on each of said protrusions, whereby said bobbin is rigidly set on said base by forcefully passing the wedge-shaped member through the groove of said base.

4. A variable inductor claimed in claim 1 in which one of said auxiliary legs vertically projects from one of the mutually perpendicular faces of said base, and the other extends parallel to the legs projecting from the other of the mutually perpendicular faces.

5. A variable inductor claimed in claim 1 in which a cup-shaped magnetic core is further provided so as to house the induction coil of said bobbin, and a clip formed into a loop is provided so as to secure said cup-shaped core to the base.

6. A variable inductor claimed in claim 5 in which one of said auxiliary legs vertically projects from one of the mutually perpendicular faces of said base, and the other auxiliary leg extends parallel to the legs projecting from the other of the mutually perpendicular faces and consists of one outwardly extending end portion of said looped clip.

7. A variable inductor claimed in claim 1 in which said base is formed into a substantial shoe heel-shape.

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U.S. Cl. X.R.

174—52; 336—83, 136, 192