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(54) Moulded product.

(57) A solenoid assembly includes a laminated core 10 defining at least two limbs (14, 15). One of the limbs is surrounded by a coil former (11) which carries a winding. The portions of the laminations which form the other link of the core are held together by clips (27) which engage with the outermost laminations.

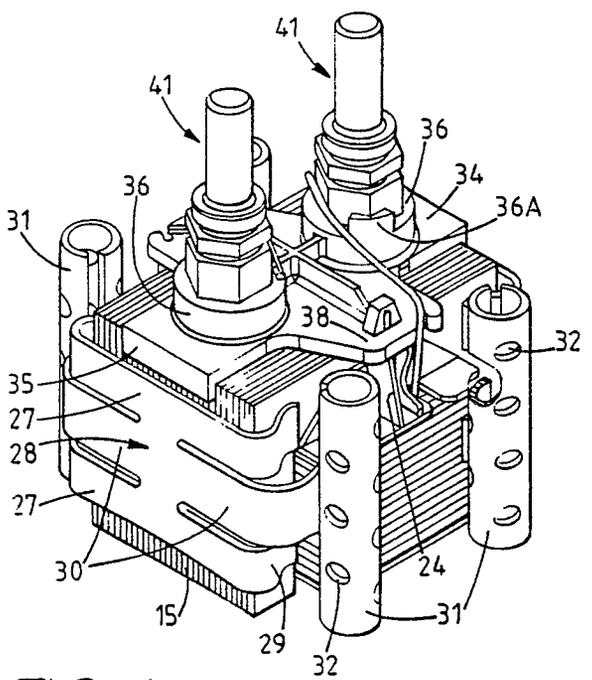

FIG. 4.

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MOULDED PRODUCT

This invention relates to a solenoid assembly of the kind comprising a plurality of laminations located in side by side relationship to form a core member having at least two limbs, a former mounted about one limb of the core member, a winding carried by the former and a moulded body encapsulating the core member and former.

In such an assembly the laminations forming the core member must be retained relative to each other and the usual practice is to assemble the stack of laminations and then to secure them together using rivets, bolts or some other technique such as by lines of weld.

The object of the invention is to provide a solenoid assembly of the kind specified in a simple and convenient form and a method of making the assembly.

According to the invention in a solenoid assembly of the kind specified the part of the laminations forming said other limb or limbs are held together by a clip or clips, each clip defining a pair of arms engaged with the outer laminations respectively of the core member to secure the laminations.

One example of a solenoid assembly in accordance with the invention will now be described with reference to the accompanying drawings in which:-

Figure 1 is a sectional side elevation of the assembly with the section being taken along the line A-A of Figure 2,

Figure 2 is a plan view of the assembly seen in Figure 1,

Figure 3 is a plan view of the underside of the assembly seen in Figure 1,

Figure 4 is a perspective view of the components of the assembly prior to the moulding operation,

Figure 5 is a sectional side elevation of part of the assembly seen in the previous figures,

Figure 6 is an end view of a wall of the part seen in Figure 5 from the interior of the part,

Figure 7 is a plan view of the part seen in Figures 5 and 6, and

Figure 8 is a plan view of a further part of the assembly.

Referring to the drawings the solenoid assembly comprises a core member generally indicated at 10, a former generally indicated at 11, the former carrying a winding 12 and a moulded body 13 which encapsulates the core member, the former and the winding.

The core member is formed from a plurality of laminations assembled together to form a stack, the particular core member being of "E" configuration. As will be seen from Figure 34, the centre limb 14 and the side limbs 15 define pole faces which are exposed on a flat face 16 of the moulding. The moulding defines through apertures 17 whereby the assembly can be secured to a housing not shown which contains a movable armature.

The perspective view of Figure 4 illustrates the solenoid assembly prior to it being inserted into a mould to form the body 13 and the construction of this subassembly will now be described.

Surrounding the centre limb 14 of the core is the former 11 and as will be seen from Figures 5-7, it is of generally rectangular form and defining a central opening 18 to receive the limb 14 of the core. The narrower sides of the former are extended upwardly to form extensions 19 having inwardly inclining sides 20. The upper side of the extension defines a tongue 21 the free end portion of which is tapered. The edges of the tongue define steps 22 respectively and the tongue is slotted at 23 along its length for a purpose to be described. As will be seen from Figures 4 and 5 the extensions 19 are provided with fillets 24 which provide support for the extensions. Moreover, as will be seen from Figure 7, the cheeks 25 of the former adjacent the extensions 19, are slotted at 26 to receive the ends of the winding as shown in Figure 4.

As will be seen from Figure 4 the parts of the laminations forming the outer limbs 15 are secured together by spaced clips 27, two such clips being provided for each limb. The clips are connected together by a bridging member 28 and each clip is of generally "C" shaped form with the arms 29 of the clips having curved end portions for engagement with the outermost laminations.

Extending outwardly from each bridging member 28 are a pair of tongues 30 which at their free ends mount tubular members 31 which extend in parallel relationship but spaced from the limbs of the core and their length is substantially equal to the lengths of the apertures 17 in the completed moulding. Conveniently the clips together with the tongues and tubular members are formed from a single sheet of material, the tubular members being rolled and in addition, provided with rows of apertures 32 along their length. It is arranged that when the clips are engaged with the respective limbs, the tubular members are positioned in curved cut-away portions 33 (Figure 7) formed at the corners of the end cheeks of the coil former.

Also provided is a moulded terminal mounting 34 formed from insulating material and which is seen in plan view in Figure 8 and in the perspective view of Figure 4. The mounting is located

against the face of the stack of laminations remote from the limbs and as seen in Figure 4, it has depending portions 35 which engage over the ends of the adjacent laminations. The terminal mounting defines a pair of spaced bosses 36 which define apertures 37 and also offset locations 36A.

The mounting also defines a pair of lateral extensions 38 the ends of which as will be seen from Figure 4, extend beyond the adjacent sides of the core. The extensions are provided with a pair of rectangular openings 39 and intermediate the openings and also between the bosses, the mounting is provided with upstanding ribs 40 which stiffen the mounting. As will be seen from Figure 4, the openings 39 are engaged by the tongues 21 on the extensions 19 of the coil former and when the tongues are moved through the openings, the slots 23 permit the edges of the tongues to deform and when fully engaged in position, the steps 22 engage with the surfaces of the extensions 28 of the terminal mounting to retain the two components in assembly.

The openings 37 receive terminal members 41 which are machined from hexagonal bar and define spigots for location in the openings 37. The locations 36A act to retain the terminal member against angular movement. The opposite ends of the terminal members are threaded and during assembly, the end turns of the coil are welded or otherwise secured to the terminal members respectively. It will be noted that the extensions 38 of the terminal mounting are provided with locating openings 42 which provide location of the portion of the wire extending between the terminal members and the winding 12.

The method of assembly is to first wind the winding upon the coil former and then to locate the former about the centre limb of the stack of laminations. The clips 27 are then fitted to the outer limbs 25 of the core and the terminal mounting 34 is secured in position following which the terminal members are located in position and the connecting wires secured thereto. The tubular members 31 locate in the cutaway portions 33 in the end cheeks of the former.

The resulting assembly is located in a mould cavity and appropriate mould material is injection moulded. The material has the effect of securing all the parts of the assembly together and following removal from the mould cavity the end face of the body is machined so that the pole faces of the limbs lie flush with the face of the body. Since during the moulding operation the mould material is injected into the mould cavity under considerable pressure, it is essential to ensure that no movement of the subassembly or parts thereof takes place during the moulding operation. The terminal members locate in apertures formed in one of the mould parts and the other mould part is provided with tapered pins which enter into the tubular members 31. As the mould parts close together the tapered pins positively locate the tubular members and during final closure of the mould parts the members 31 are subjected to axial pinching and in addition, axial pressure is also applied to the terminal members. Following the moulding operation the complete subassembly apart from the end portions of the terminal members, is encapsulated in the moulding material and this moulding material also flows into the apertures 32 in the tubular members to provide a lining to the bores defined by the tubular members.

As shown in Figure 4 the terminal mounting 34 does not extend the full width of the stack of laminations. The mounting can be so extended together with the depending portions 35 to provide endwise location of all the laminations of the stack.

The tubular members 31 may be formed as separate items and if desired formed from continuous tube as opposed to being wrapped. In addition, the tubes may or may not be provided with the apertures 32. The tubular members may be waisted intermediate their ends and the tongues 30 may be wrapped around the waisted portions of the members respectively.

Claims

1. A solenoid assembly comprising a plurality of laminations located in side by side relationship to form a core member (10) having at least two limbs (14, 15) a former (11) mounted about one limb (14) of the core member (10), a winding (12) carried by the former (11) and a moulded body (13) encapsulating the core member, the former and the winding characterised in that the parts of the laminations forming said other limb (15) or limbs are held together by a clip (27) or clips each clip (27) defining a pair of arms (29) engaged with the outer laminations of the core member (10) to secure the laminations.

2. An assembly according to Claim 1 characterised in that the or each of said other limbs (15) is provided with a pair of clips (27) which are held in spaced relationship by a bridging member (28), the bridging member having a pair of tongues (30) extending therefrom, the ends of the tongues remote from the bridging member (28) mounting tubular members (31) respectively which in the completed assembly define apertures for retaining screws.

3. An assembly according to Claim 2 characterised by a terminal mounting (34) located against the end of the core member (10) remote from the pole faces defined by the limbs (14, 15) said termi-

nal mounting (34) defining lateral extensions (38) which extend over the adjacent sides of the core member (10) and extensions (19) carried by the former (11) engaged with the lateral extensions (38) to secure the terminal mounting (34) and former 11 to the core member (10).

4. An assembly according to Claim 3 characterised in that said terminal mounting (34) defines depending portions (35) which engage over the end edges of the core member (10).

5. An assembly according to Claim 3 or Claim 4 characterised in that said extensions (19) on the former are provided with fillets (24) extending between the extensions (19) and the adjacent cheeks (25) of the former (11).

6. An assembly according to Claim 3 characterised in that the terminal mounting (34) defines bosses (36) in which are formed openings (37) to receive spigot portions of terminal members (41) respectively.

7. An assembly according to Claim 6 characterised in that said bosses (36) define locations (36A) for engagement with non circular portions of the terminal members (41) thereby to locate the terminal members against rotation.

8. An assembly according to Claim 5 characterised in that the cheeks (25) of the former (11) have cutaway portions (33) in which said tubular members (31) are positioned respectively.

9. An assembly according to Claim 2 characterised in that said clips (27), the bridging member (28), the tongues (30) and the tubular members (31) are formed from a single sheet of material with the tubular members (31) being formed by rolling the sheet material.

10. An assembly according to claim 1 characterised by tubular members (31) which in the completed assembly define apertures for retaining screws.

11. An assembly according to Claim 2 characterised in that said tubular members (31) are formed with a narrower or waisted portion intermediate the ends, said tongues (30) extending about said waisted portions respectively.

A method of producing a solenoid assembly comprising assembling a stack of laminations to form a core member (10) which has at least two limbs (14, 15), locating a wound coil former (11) about one of said limbs (14), securing the portions of the laminations forming the other limb or limbs (15) of the core member (10) using a clip (27) which has end portions (29) engaging the side faces of the outermost laminations, mounting a terminal mounting (34) on the core member and securing the terminal (34) to the former, locating the sub assembly in a mould and introducing moulding material into the mould.

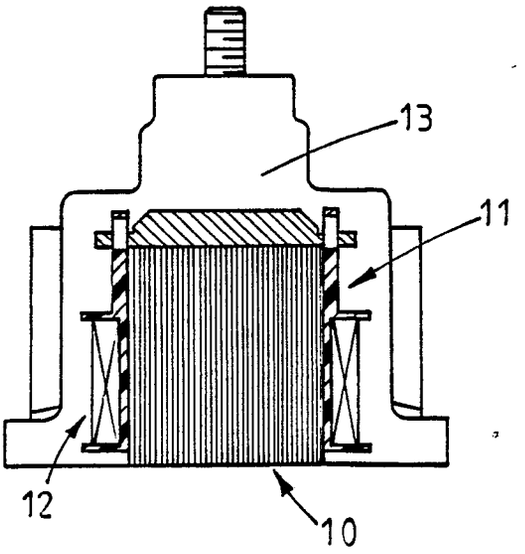

FIG.1.

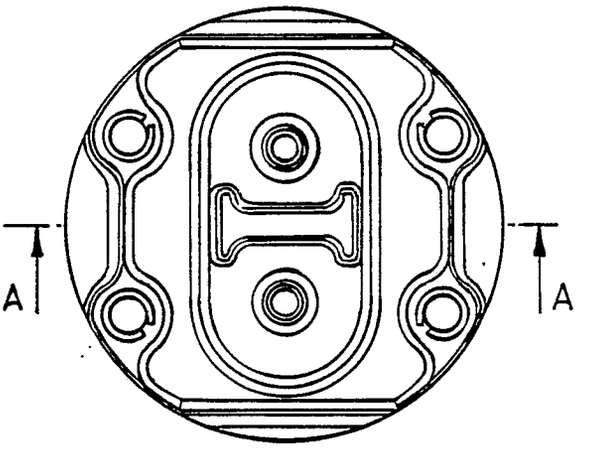

FIG.2.

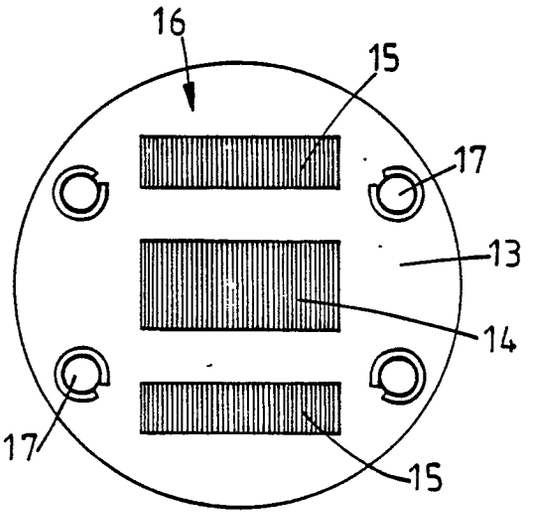

FIG.3.

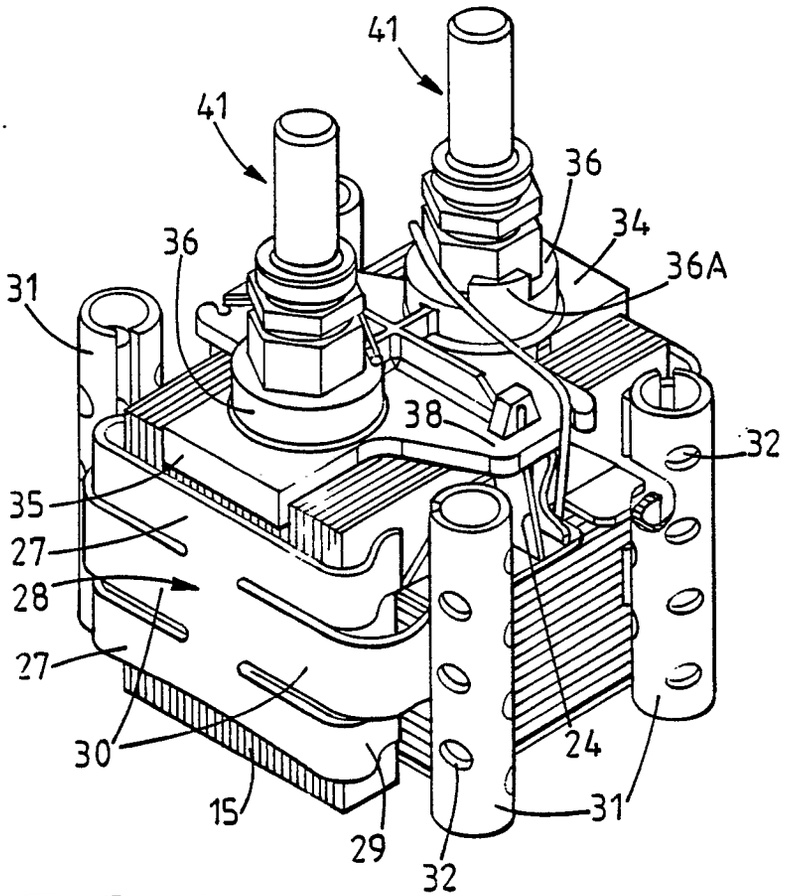

FIG. 4.

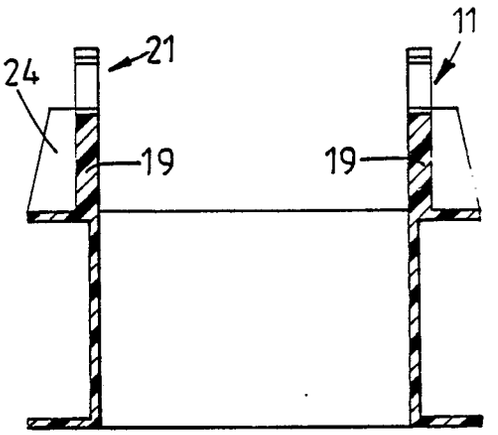

FIG.5.

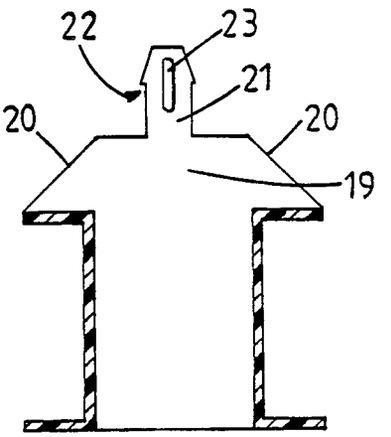

FIG.6.

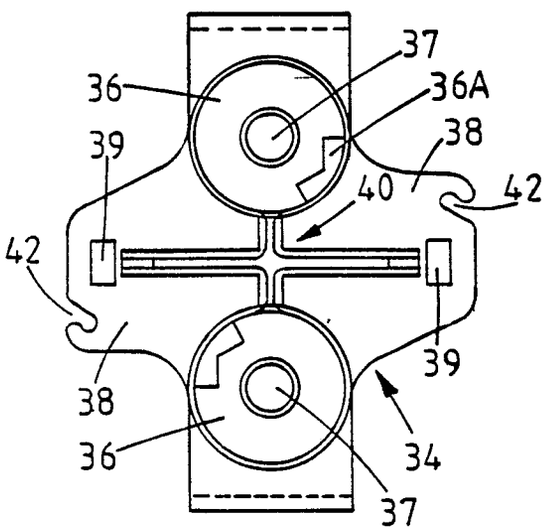

FIG.8

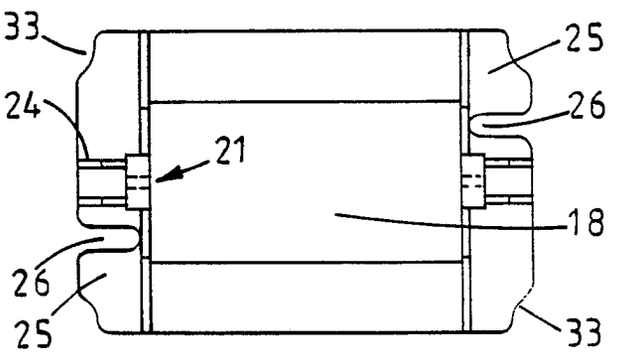

FIG.7.

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EUROPEAN SEARCH REPORT

Application Number

EP 88 31 0529

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
X	US-A-3 110 873 (GENERAL ELECTRIC CO.) * Column 3, lines 19-75 *	1	H 01 F 27/26
A		2,9	H 01 F 41/00
A	US-A-3 524 156 (S. HORBACH) * Column 2, line 30 - column 3, line 65 *	3,5	
A	DE-U-7 405 664 (BLAUPUNKT-WERKE GmbH) * Page 2 *	3	
A	FR-A-2 221 899 (FRATER S.A.E.) * Figures 1,2 *	3,4	
A	DE-A-1 613 777 (E. BLUM) * Page 7, paragraphs 2,3; page 8 *	5	
A	GB-A- 771 934 (THE BRITISH THOMSON-HOUSTON CO., LTD) * Page 1, line 65 - page 2, line 48 *	6	
A	US-A-3 665 358 (COLLINS RADIO CO.) * Column 1, lines 37-49; column 2, lines 7-16 *	6	TECHNICAL FIELDS SEARCHED (Int. Cl.4)
A	US-A-4 156 888 (DENKI ONKYO CO., LTD)		H 01 F 27/00
A	US-A-3 169 235 (JEFFERSON ELECTRIC CO.)		H 01 F 41/00
A	TECHNICAL DIGEST (WESTERN ELECTRIC), no. 76, March 1985, page 17, AT&T Technologies, New York, US; H. CURTIS III et al.: "Ferrite choke coil assembly"		

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	01-03-1989	VANHULLE R.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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