

(19) **DANMARK**

(10) **DK/EP 3729609 T3**



(12)

Oversættelse af europæisk patentskrift

Patent- og
Varemærkestyrelsen

-
- (51) Int.Cl.: **H 02 K 3/52 (2006.01)** **H 02 K 16/04 (2006.01)**
- (45) Oversættelsen bekendtgjort den: **2022-03-07**
- (80) Dato for Den Europæiske Patentmyndigheds bekendtgørelse om meddelelse af patentet: **2022-01-19**
- (86) Europæisk ansøgning nr.: **18836295.8**
- (86) Europæisk indleveringsdag: **2018-12-13**
- (87) Den europæiske ansøgnings publiceringsdag: **2020-10-28**
- (86) International ansøgning nr.: **IB2018059998**
- (87) Internationalt publikationsnr.: **WO2019123133**
- (30) Prioritet: **2017-12-18 FR 1701313**
- (84) Designerede stater: **AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR**
- (73) Patenthaver: **Whylot, Parc d'Activités Quercypôle 2, 46100 Cambes, Frankrig**
- (72) Opfinder: **MIHAILA, Vasile, Lieu dit la Castanial, 46100 Figeac, Frankrig**
RAVAUD, Romain, Lieudit Font Neuve, 46240 Labastide-Murat, Frankrig
- (74) Fuldmægtig i Danmark: **Denemeyer & Associates S.A, P.O. Box 700425, DE-81304 Munich, Tyskland**
- (54) Benævnelse: **ELEKTROMAGNETISK MOTOR- ELLER GENERATORSTATOR MED INDIVIDUEL VIKLINGSSTØTTE KLIKKET PÅ EN TILHØRENDE TAND**
- (56) Fremdragne publikationer:
EP-A1- 1 255 344
EP-A1- 2 329 583
JP-A- 2005 143 268
US-A1- 2010 077 601

STATOR FOR A MOTOR OR ELECTROMAGNETIC GENERATOR WITH INDIVIDUAL WINDING SUPPORT SNAP-FITTED TO AN ASSOCIATED TOOTH

The present invention relates to a stator for an electromagnetic motor or generator with individual winding support snap-fitted to an associated tooth. Advantageously, the electromagnetic motor or generator is an axial-flux one.

The present invention provides an advantageous but non-limiting application for an electromagnetic motor delivering a high power with a high rotational speed of the rotor, which is obtained by the specific characteristics of the stator according to the present invention in interaction with the specific characteristics of a rotor associated to a stator. Such a motor or generator can be used, for example, as an electromagnetic motor in a fully electric or hybrid motor vehicle.

Advantageously, but in a non-limiting manner, the electromagnetic motor or generator can comprise at least one rotor surrounded by two stators, and these elements can be superimposed with respect to one another by being separated by at least one air gap on the same shaft.

In high-speed applications, it is necessary to have not only a compact system made possible by the reduction of the mass and size of the axial motor for optimum efficiency, but also very high mechanical strength of the rotating part, that is to say the rotor(s), in order to improve the reliability of the system but also of the stator(s).

In high-speed applications, it is necessary to reduce losses for optimum performance. In automotive applications, miniaturisation is increasingly sought. For this reason it is important to have a compact system made possible by the reduction of the mass and the size of the axial motor, but also very high mechanical strength of the rotating part, in order to improve the reliability of the system.

For an axial-flux electromagnetic machine, the rotor comprises a disc-shaped body having two circular faces connected by a thickness, the disc being delimited between an outer ring and an inner perimeter defining a recess for a rotation shaft.

At least two permanent magnets are applied against at least one of the two circular faces of the body, referred to as the support face. For a single-air gap rotor intended to be associated to a stator, only one circular face of the body carries magnets, while for a two-air gap rotor with a respective stator, both faces carry magnets.

The magnets are each held on the face or their respective face by holding means, a gap being left between said at least two magnets on the same face.

For the or each stator, these carry winding elements comprising a tooth carrying a

coil, the tooth being surrounded on each of its sides by a notch, a metal wire which is a good conductor being wound on the tooth to form each winding.

When the one or more series of windings are supplied with electricity, the rotor which is secured to the motor output shaft is subjected to a torque resulting from the magnetic field, the generated magnetic flux being an axial flux for an axial-flux electromagnetic machine and a radial flux for a radial-flux machine.

There are several ways to form a winding around the teeth, with the simplest being to form a concentric winding. This was not satisfactory because of the poor performance of the motor or of the generator thus wound. However, great progress has been made in the design of the rotors by increasing their solidity and the efficiency of the motor and of the machine, which renders proper the use of a concentric winding for a stator.

However, it is necessary to rework the design of a concentric winding stator to rationalize its manufacture.

Document EP-A-2 329 583 describes a stator for an electromagnetic motor or generator comprising windings and a magnetic circuit, the stator comprising a frame of circular or polygonal shape and winding support teeth, each winding resting on a tooth while at least partially surrounding a winding support.

Each winding support comprises or is associated to snap-fitting means linked to complementary snap-fitting means carried by a tooth associated to the winding support so that the winding support is secured to the associated tooth, with, on the one hand, each tooth and, on the other hand, the intermediate and cover portions of each winding support being prismatic with two triangular faces or of trapezoidal with a small base innermost to the frame and a large base outermost to the frame connected by two inclined lateral faces.

This document does not make it possible to rationalise the manufacture of a toothed stator by making it easier to wind the windings of electric wires on each tooth due to the snap-fitting means proposed in this document.

The problem underlying the present invention is to rationalise the manufacture of a toothed stator by making it easier to wind the windings of electric wires on each tooth.

To this end, the present invention relates to a motor stator or electromagnetic generator comprising windings and a magnetic circuit, the stator comprising a circular or polygonal frame and winding support teeth, each winding resting on a tooth while surrounding at least partially a winding support, each winding support comprising or being associated to snap-fitting means cooperating with complementary snap-fitting means carried by a tooth associated to the winding support so that the winding support is secured

to the associated tooth with, on the one hand, each tooth and, on the other hand, the intermediate and planar cover portions of each winding support being prismatic with two triangular faces or trapezoidal with a small base radially innermost to the frame and a large base radially outermost to the frame connected by two inclined lateral faces, characterised in that the outer contour of the planar cover portion internally delimits a triangular or quadrangular empty space carrying either at least one snap-fitting portion projecting towards the tooth while forming the snap-fitting means, the tooth including proximate to each lateral edge of its face opposite the winding a groove, the two grooves respectively accommodating one of the snap-fitting portions while forming the complementary snap-fitting means or a blocking element which is prismatic with two triangular or trapezoidal faces being inserted, the blocking element having an outer contour corresponding to the inner contour of the empty space with a clearance between the outer contour of the blocking element and the inner contour of the space just enough for an insertion of the blocking element into the empty space, the edges of the triangular face opposite the associated tooth of the blocking element or at least the two edges opposite the associated tooth of the inclined lateral faces of the trapezoidal shape of the blocking element carrying at least one snap-fitting portion projecting towards the tooth while forming the snap-fitting means, the tooth including proximate to each lateral edge of its face opposite the winding a groove, the two grooves respectively accommodating one of the snap-fitting portions while forming the complementary snap-fitting means.

The technical effect obtained by this preferred embodiment is ease of assembly of the windings, which further enhances the use of concentric windings for an electromagnetic motor or generator, which makes it possible to increase their use. The snap-fitting is done easily and allows a firm maintenance of the winding on the tooth by obstructing an exit of the winding from an insertion on the tooth.

In general, the intermediate and cover portions have a shape adapted to that of the associated tooth.

In the first embodiment of the present invention, with a snap-fitting portion protruding towards the tooth, the snap-fitting is done by the lateral faces of the empty space in the winding support after insertion of the tooth in this empty space. The lateral faces of the space can each carry a lug fitting into an associated groove of the tooth.

The second embodiment requires a blocking element. It is this blocking element which performs the snap-fitting with the tooth. Proximity to each lateral edge of the face opposite the winding does not necessarily mean that the grooves are on this face. The grooves can be on the lateral faces of the tooth close to the lateral edge of the opposite

face.

Advantageously, the winding support comprises an intermediate portion on which the winding is wound and a planar cover portion located the furthestmost from the associated tooth in a position for securing the winding support on the tooth by being separated from the tooth by the winding and the intermediate portion, the planar cover portion having an outer contour remotely covering at least one outer perimeter opposite the winding and by abutting against the outer perimeter of the winding, the winding support being made in one piece or not.

It is the planar cover portion by its outer contour which obstructs against an exit of the windings from an insertion around the tooth. The intermediate portion may have grooves corresponding to the size of the electric wire to be wound for easy winding of the windings.

Advantageously, each winding is wound concentrically around the intermediate portion. This is the simplest way to wind a winding.

Advantageously, the planar cover portion associated to one tooth is adjacent to a planar cover portion associated to each adjacent tooth, a set of cover portions forming a ring covering completely the teeth and the intervals separating them.

This makes it possible to obtain a complete and continuous ring, which ensures better protection of the windings.

Advantageously, the winding supports are made of plastic. This is particularly the case in the second embodiment requiring a blocking element which is advantageously metallic to it.

Advantageously, the windings are three-phase windings.

Advantageously, the winding support comprises at one end turned towards the frame, a striated support of the winding phases, a set of the striated supports of the winding phases forming a ring at the root of the teeth against the frame of the stator supporting the teeth, the ring with concentric striations. The winding phases are thus maintained in the striated supports creating a complete and closed ring.

Advantageously, each tooth is formed by wound or laminated sheet metals.

The invention relates to an electric motor or generator comprising at least one rotor and at least one stator, the motor being an axial-flux one, characterised in that the stator is as previously described.

Advantageously, said at least one rotor comprises magnet structures forming magnet poles, each magnet structure consisting of a plurality of magnet units, cover discs being disposed axially on each of two opposite axial faces of said at least one rotor, the

cover discs being made of a composite, the cover discs and the magnet structures being coated in an outer coating layer of composite defining the outer contour of the said at least one rotor.

One of the main purposes of the preferred embodiment of the present invention is to replace one or more large magnets with a plurality of small magnets. A magnetic flux is therefore created by a multitude of small magnets, the number of which may be at least 20 and may even exceed 100 per magnet pole. A rotor of the prior art could include from 1 to 10 magnets while the preferred embodiments of the present invention provides many more small magnets in each magnet structure.

It is important not to confuse a magnet structure, of which a rotor may carry, for example, five to ten or even more, with magnet units, which are clearly more numerous, and of which a rotor may carry, for example, several hundred. The small magnet units according to the present invention can be inserted into respective cells by a robot.

This makes it possible to obtain a rotor which, among other advantages, can rotate at high speed and which does not include iron, which limits rotor losses.

According to the preferred embodiment of the invention, it has been discovered that many magnet units provide a magnet structure that is stronger in terms of the overall bending of the rotor while producing very little heat due to the low losses generated, the heat dissipated by the magnet units being less than the heat dissipated by a corresponding larger single-piece magnet.

The magnet structure includes a layer of non-conductive composite coating the magnet units and the lattice. In addition, its mechanical strength can be high and it can be coated easily, in particular by injecting the composite material onto an arrangement of single magnets maintained in place with respect to one another by any means.

With such a rotor, it is advantageous to combine one or two stators comprising iron teeth with concentric windings, which is easy to achieve. The only difficulty is to simplify the operation of winding teeth, which the present invention has solved by using a winding support which can be snapped onto the tooth.

The present invention accomplishes the reverse approach to the approach followed by many manufacturers of electromagnetic motors and generators. It is known to focus the innovation effort on stators by designing windings that are increasingly complex and difficult to design.

Due to the design of a high-performance rotor containing no iron and coated with composite containing magnet structures each made of a plurality of magnets, this has made it possible to use concentric windings for the stators, whereas such a concentric

winding did not provide complete satisfaction with permanent magnets in one piece as employed by the most recent state of the art.

It turns out that the use of such a combination of a composite rotor with at least one iron stator including iron teeth or studs and a concentric winding for the stator mounted on a winding support provided synergy with regard to the power of the motor or generator used as well as the ease of manufacture and mechanical strength of the motor or generator.

Advantageously, the motor comprises at least two stators and at least one rotor.

The present invention also relates to a method for winding windings on a respective tooth of a stator of an electromagnetic motor or generator, the stator or the motor being as described above, characterised in that it comprises the following steps:

- winding an electrically-conductive wire around a portion of a winding portion, the winding support being inserted at least partially or not around the tooth,
- in the case where the winding support was not already at least partially inserted around the tooth, at least partially inserting the winding around the tooth, and
- snap-fitting the winding support on the tooth by pushing the winding support towards the frame of the stator.

A firm hold of the windings on the associated tooth is thus obtained by the use of a winding support supporting the winding and preventing it from coming out around the tooth by abutting against such an outlet. The securing of the winding support with the associated tooth is done by snap-fitting simply by sufficiently inserting the winding support around the tooth and pushing it against the frame, by inserting snap-fitting means in a respective groove as a complementary snap-fitting means.

Advantageously, the lateral lugs carried in the interior of the winding support in the vicinity of the contour of a tooth penetrate into a respective groove carried by the tooth, this snap-fitting taking place automatically by elasticity of the winding support or of a penetrating blocking element in the winding support and at least partially surrounding the tooth.

Other features, aims and advantages of the present invention will appear from the following detailed description and with regard to the appended drawings given as non-exhaustive examples, in which:

- figure 1 is a schematic representation of a perspective view of a stator comprising teeth and windings mounted on a respective tooth, the stator according to the present invention by incorporating a winding support snap-fitting on the tooth, two winding supports being shown in this figure 1,

- figure 2 is a schematic representation of an exploded perspective view of a winding support and a winding, the winding support being used in a stator according to the present invention,

- figure 3 reproduces the characteristics of figure 1, with a winding support and a blocking element shown at a distance from the stator according to the present invention, the snap-fitting means of the blocking element and the complementary snap-fitting means carried by the associated tooth being visible in this figure 3,

- figure 4 is a schematic representation of the framed portion C enlarged with respect to the other figures of a perspective view of a tooth portion showing the complementary snap-fitting means carried by the tooth, this tooth forming part of a stator according to the present invention.

The figures are provided by way of example and the invention is not limited thereto. They constitute schematic representations of principle intended to facilitate understanding of the invention and are not necessarily on the scale of practical applications. In particular, the dimensions of the different parts are not representative of reality.

In figures 1 and 3, only a winding support, a blocking element and a striated phase support are referenced, but what is stated for these respective elements applies to the other corresponding elements. For purposes of clarity of the figures, all the windings and winding supports are not represented and all the teeth, with the exception of two or one tooth, are left without winding.

Referring to all the figures and more particularly to figures 1 and 3, the present invention relates to a stator 8 of an electromagnetic motor or generator comprising windings 4 and a magnetic circuit comprising a frame of circular or polygonal shape and winding support teeth 3.

In figures 1 and 3, only one tooth 3 is referenced but what is stated for this referenced tooth 3 is valid for all the other teeth 3 of the stator 8.

According to the invention, each winding 4 rests on a tooth 3, at least partially surrounding a winding support 13, 14. This implies that at least a portion of the winding support 13, 14 is inserted around the tooth 3.

Each winding support 13, 14 can comprise or be associated to snap-fitting means 15' carried by a part linked to complementary snap-fitting means 3' carried by a tooth 3 associated to the winding support 13, 14 so that the winding support 13, 14 is secured with the associated tooth 3.

The snap-fitting can be done directly between the winding support 13, 14 and the

tooth 3, in which case each winding support 13, 14 carries the snap-fitting means 15' or between an intermediate part secured to the winding support 13, 14 and the tooth 3, in which case each winding support 13, 14 is associated to snap-fitting means 15' that the winding support 13, 14 does not carry.

As can be seen in particular in figure 3, the winding support 13, 14 can comprise an intermediate portion 13 on which the winding 4 is wound and a planar cover portion 14 located the furthestmost from the associated tooth 3 in a position for securing the winding support 13, 14 on the tooth 3 by being separated from the tooth 3 by the winding 4 and the intermediate portion 13. The planar cover portion 14 and the intermediate portion 13 can be made in one piece.

The planar cover portion 14 may have an outer contour remotely covering at least one outer periphery opposite the winding 4 and one face of the tooth 3 turned towards the winding. At a distance means that the planar cover portion 14 is not resting on the face of the tooth 3 facing towards winding 4 and cover means that the planar cover portion 14 hides the face of the tooth 3 facing towards the winding 4 when viewed from the front. Covering at least means that the area of the planar cover portion 14 can be larger than the area of the tooth 3 turned towards the winding.

The cover portion 14 may abut against an exit of the winding 4 around the tooth 3 and around the intermediate portion 13.

As can be seen in figure 3, each winding 4 is wound concentrically around the intermediate portion 13.

As can be seen in figures 1 to 3, on the one hand, each tooth 3 and, on the other hand, the intermediate 13 and cover 14 portions of each winding support 13, 14 can be trapezoidal in shape with a small base innermost to the frame and a large base outermost to the frame connected by two inclined lateral faces.

It is also possible for the intermediate 13 and cover 14 portions of each winding support 13, 14 to be prismatic in shape with two triangular faces. This is not shown in the figures but is easily derivable from these figures.

As previously mentioned, the snap-fitting between the winding support 13, 14 and the associated tooth 3 can be direct or indirect, direct meaning that the winding support 13, 14 directly engages with the associated tooth 3 and indirect meaning that an intermediate blocking element 15 secured to the winding support 13, 14 snap-fits to the associated tooth 3.

Only the second embodiment with indirect snap-fitting is shown in the figures. However, for the description of the first embodiment, reference will be made to the figures

for the characteristics common to the two embodiments.

In the first embodiment with direct snap-fitting not shown in the figures, the outer contour of planar cover portion 14 internally delimits a triangular or quadrangular empty space 11 carrying at least one snap-fitting portion projecting towards the tooth 3 while forming the snap-fitting means 15.

As complementary snap-fitting means 3', the tooth 3 may comprise near each lateral edge of its face opposite the winding 4 a groove 3', the two grooves 3' respectively accommodating one of the snap-fitting portions. The complementary snap-fitting means 3' can thus be the same in the two embodiments of direct or indirect snap-fitting. This can be seen in figure 4 showing an enlarged view of a tooth portion 3 carrying a groove 3' and is common to both embodiments.

In the second embodiment with indirect snap-fitting, with reference to figures 1 to 4, the outer contour of the planar cover portion 14 can internally delimit a triangular or quadrangular empty space 11 according to a prismatic or trapezoidal shape of cover portion 14.

In this triangular or quadrangular empty space 11, a blocking element 15 of prismatic shape with two triangular or trapezoidal faces is inserted. The blocking element 15 may have an outer contour corresponding to the inner contour of the empty space 11 with just sufficient space between the outer contour of the blocking element 15 and the inner contour of the empty space 11 for insertion of the blocking element 15 in the empty space 11.

The edges of the triangular face opposite the associated tooth 3 of the blocking element 15 or at least the two edges opposite the associated tooth 3 of the inclined lateral faces of the trapezoidal shape of the blocking element 15 can carry at least one snap-fitting portion 15' projecting towards the tooth 3 while forming the snap-fitting means 15'.

As for the first embodiment, the associated tooth 3 may comprise near each lateral edge of its face opposite the winding 4 a groove, the two grooves 3' respectively accommodating one of the snap-fitting portions while forming the complementary snap-fitting means 3'. The grooves 3' can preferably extend over lateral inclined faces of the tooth 3 and not necessarily over the face of the tooth opposite the winding.

This can be valid for all winding supports 4 and all teeth 3. The planar cover portion 14 associated to a tooth 3 can be adjacent to a planar cover portion 14 associated to each adjacent tooth 3. A set of cover portions can then form a ring entirely covering the teeth 3 and the intervals separating them.

The teeth 3 can be made of iron or plasto-ferrite while the winding supports 4 can

be made of resistant plastic. Each tooth 3 can be formed by wound or laminated sheet metals.

The blocking element 15, when present, is advantageously metallic in order to be resistant and to achieve a firm snap-fitting in position. The windings 4 can be three-phase windings 4.

As can be seen in figures 1 to 3, the winding support 13, 14 may comprise, at one end turned towards the frame, a striated support for winding phases 12. A set of striated supports for the phases 12 of the winding 4 can form a ring 7 at the root of the teeth 3 against the frame of the stator 8 supporting the teeth 3, the ring 7 having concentric striations 7', the ring being concentric with the centre of the stator 8 having a central recess.

The invention relates to an electric motor or generator comprising at least one rotor and at least one stator 8 as previously described, the motor being an axial-flux one. The motor can comprise at least two stators 8 and at least one rotor.

In a particularly advantageous embodiment but not shown in the figures, the rotor or rotors comprise magnet structures forming magnet poles, each magnet structure being composed of a plurality of magnet units. Cover discs can be arranged axially on each of two opposite axial faces of said at least one rotor.

It is possible to use different types of materials for the selected magnet units, for example samarium-cobalt (Sm-Co) alloys, aluminium, nickel and cobalt alloys, hard ferrites and neodymium-iron-boron materials, the important thing being that these materials withstand being machined into studs of small width or small diameter with respect to their length.

Cover discs can be made from composite. Furthermore, the cover discs and the magnet structures may be coated in an external coating layer of composite defining the outer contour of said at least one rotor.

The present invention also relates to a method for winding windings 4 on a respective tooth 3 of a stator 8 of an electromagnetic motor or generator, the stator 8 or the motor being as described above.

The method comprises the step of winding 4 an electrically conductive wire, advantageously made of copper, around a portion of a winding support 13, 14, the winding support 13, 14 being inserted at least partially or not around the associated tooth 3.

Indeed, the winding support 13, 14 can be moved away from the associated tooth 3 during the winding 4 or already partially inserted around the tooth.

In the first case, when the winding support 13, 14 was not previously at least partially inserted around the tooth 3, the winding 4 is inserted at least partially around the tooth.

The next step is to snap-fit the winding support 13, 14 onto tooth 3 by pushing the winding support 13, 14 towards the frame of the stator 8, i.e. inserting the winding support 13, 14 until its snap-fitting means 15' is linked to complementary snap-fitting means 3' provided on the tooth.

**ELEKTROMAGNETISK MOTOR- ELLER GENERATORSTATOR MED INDIVIDUEL
VIKLINGSSTØTTE KLIKKET PÅ EN TILHØRENDE TAND**

PATENTKRAV

1. Elektromagnetisk motor- eller generatorstator (8), der omfatter viklinger (4) og et magnetisk kredsløb, hvor statoren (8) omfatter et topstykke med cirkulær eller polygonal form og viklingsstøttetænder (3) med hver vikling (4) hvilende på en tand (3) ved i det mindste delvist at omgive en viklingsstøtte (13, 14), hvor hver viklingsstøtte (13, 14) omfatter eller er forbundet med kliklåsemidler (15') der samvirker med supplerende kliklåsemidler (3') båret af en tand (3), der er forbundet med viklingsstøtten (13, 14), således at viklingsstøtten (13, 14) er sammenkoblet med den forbundne tand (3) med, på den ene side, hver tand (3) og, på den anden side, de mellemliggende (13) og plane afdækningsdele (14) for hver viklingsstøtte (13, 14) med prismatisk form med to trekantede eller trapezformede flader med en lille base helt radialt inderst i topstykket og en stor base helt radialt yderst på topstykket, forbundet med to skrå sideflader, kendetegnet ved, at den ydre kontur af den plane afdækningsdel (14) indvendigt afgrænser et trekantet eller firkantet tomrum (11), der bærer enten mindst en kliklåsedel, der rager frem mod tanden (3) og derved danner kliklåsemidlerne, hvor tanden (3) i nærheden af hver af dens flades sidekanter, der vender mod viklingen (4), omfatter en rille (3'), og hvor de to riller (3') henholdsvis huser en af kliklåsedelene og derved danner de supplerende kliklåsemidler (3') eller et blokeringselement (15) med prismatisk form med to indførte trekantede eller trapezformede flader, hvor blokeringselementet (15) har en ydre kontur svarende til tomrummets (11) indvendige kontur med netop tilstrækkeligt spil mellem blokeringselementets (15) ydre kontur og tomrummets (11) indvendige kontur til en indførelse af blokeringselementet (15) i tomrummet (11) med kanterne af den trekantede flade, der vender mod tanden (3), forbundet til blokeringselementet (15) eller i det mindste de to kanter, der vender mod tanden (3), forbundet med de skrå sideflader på blokeringselementets (15) trapezform, der bærer mindst en kliklåsedel (15'), som rager frem mod tanden (3) og derved danner kliklåsemidlerne (15'), hvor tanden (3) i nærheden af hver af dens flades sidekanter, der vender mod viklingen (4), omfatter en rille (3'), og hvor de to riller (3') henholdsvis huser en af kliklåsedelene (15') og derved danner de supplerende kliklåsemidler (3').

2. Stator (8) ifølge det foregående krav, hvor viklingsstøtten (13, 14) omfatter en

mellemdeel (13), hvorpå viklingen (4) er vundet, og en plan afdækningsdel (14), der ligger længst væk fra den tilhørende tand (3) på positionen for viklingsstøttens (13, 14) sammenkobling med tanden (3), idet den er adskilt fra tanden (3) af viklingen (4) og mellemdelen (13), og hvor den plane afdækningsdel (14) har en udvendig kontur, der i en afstand dækker mindst en udvendig omkreds i forhold til viklingen (4) og ligger an mod viklingens (4) udvendige omkreds, uanset om viklingsstøtten (13, 14) er fremstillet i ét stykke eller ej.

3. Stator (8) ifølge det foregående krav, hvor hver vikling (4) er koncentrisk viklet om mellemdelen (13).

4. Stator (8) ifølge et hvilket som helst af de foregående krav, hvor den plane afdækningsdel (14), forbundet med en tand (3), støder op til en plan afdækningsdel (14), forbundet med hver tilstødende tand (3), en samling af afdækningsdelene (14), som tilsammen danner en ring, der fuldstændigt dækker tænderne (3) og intervallerne, der adskiller dem.

5. Stator (8) ifølge et hvilket som helst af de foregående krav, hvor støtten til viklingen (4) er af plastik.

6. Stator (8) ifølge et hvilket som helst af de foregående krav, hvor viklingerne (4) er trefasede viklinger (4).

7. Stator (8) ifølge foregående krav, hvor viklingsstøtten (13, 14) i den ene ende, vendt mod topstykket, omfatter en furet støtte til viklingsfaserne (12), en samling furede støtter til viklingernes (4) faser (12), der tilsammen danner en ring (7) ved tændernes (3) base mod statorens (8) topstykke, som støtter tænderne (3), og hvor ringen (7) har koncentriske furer (7').

8. Stator (8) ifølge et hvilket som helst af de foregående krav, hvor hver tand (3) er dannet af valsede eller laminerede plader.

9. Elektrisk motor eller generator, der omfatter mindst en rotor og mindst en stator (8), hvor motoren er en aksial fluxmotor, kendetegnet ved, at statoren (8) er ifølge et hvilket som helst af de foregående krav.

10. Motor ifølge foregående krav, hvor omtalte mindst ene rotor omfatter magnetstrukturer, der danner magnetpoler, hvor hver magnetstruktur er sammensat af flere individuelle magneter, idet dækskiver er anbragt aksialt på hver af den mindst ene rotors to modstående aksiale flader, og hvor dækskiverne er lavet af komposit, og dækskiverne og magnetstrukturerne er belagt med et ydre belægningslag af komposit, der definerer den nævnte mindst ene rotors ydre kontur.

11. Motor ifølge foregående krav, hvor denne omfatter mindst to statorer (8) og mindst en rotor.

12. Fremgangsmåde til vikling af spoler (4) på en respektive tand (3) på en stator (8) i en elektromagnetisk motor eller generator, hvor statoren (8) er ifølge et hvilket som helst af kravene 1 til 8, eller motoren er i overensstemmelse med et hvilket som helst af kravene 9 til 11, kendetegnet ved, at den omfatter følgende trin:

- vikling (4) af en elektrisk ledende ledning omkring en del af en viklingsstøtte (13, 14), hvor viklingsstøtten (13, 14) i det mindste delvist eller ej er indført omkring tanden (3),

- når viklingsstøtten (13, 14) ikke i forvejen var i det mindste delvist indført omkring tanden (3), så i det mindste en delvis indførelse af viklingen (4) omkring tanden (3), og

- kliklåsning af viklingsstøtten (13, 14) på tanden (3) ved at skubbe viklingsstøtten (13, 14) mod statorens (8) topstykke ved indførelse af kliklåsemidler i en respektive rille (3') i form af et supplerede kliklåsemiddel.

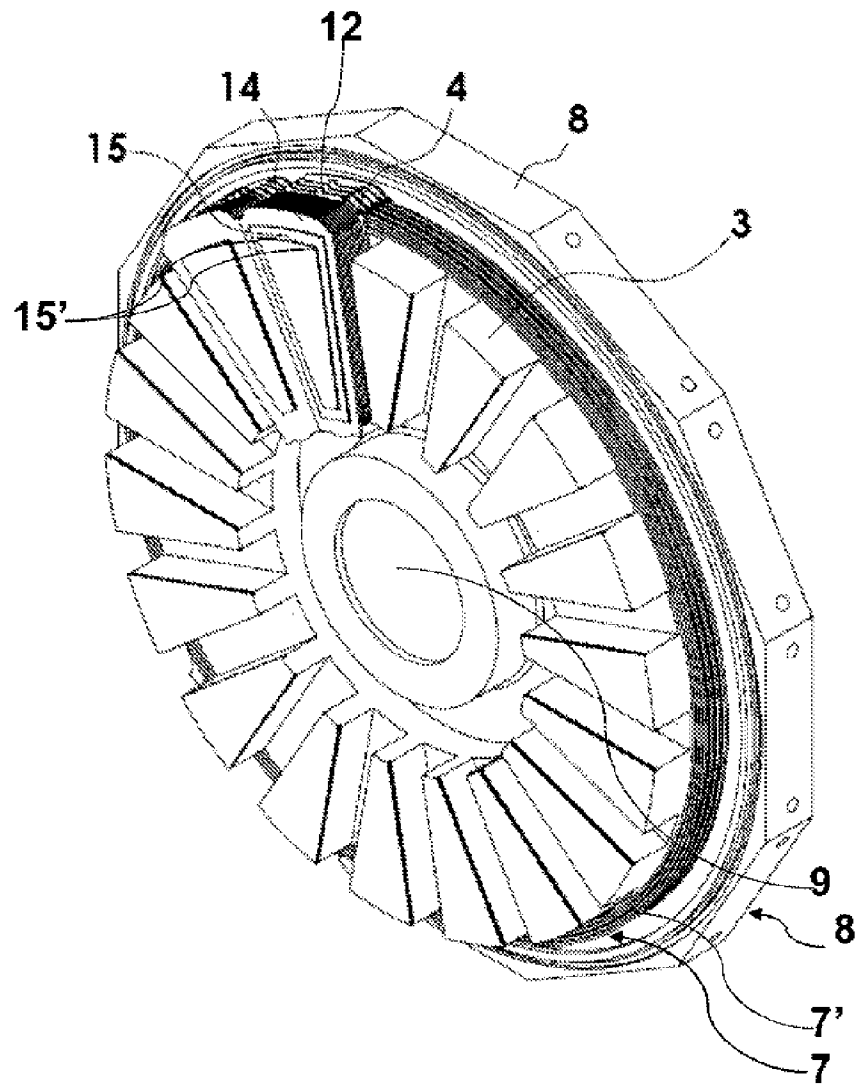


FIG.1

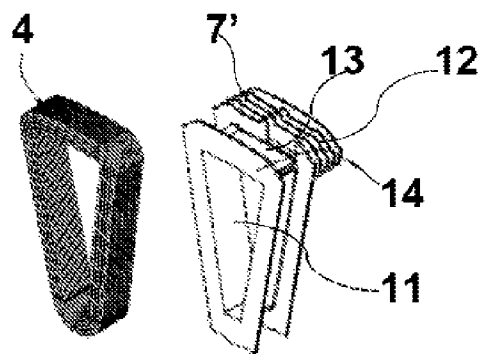


FIG.2

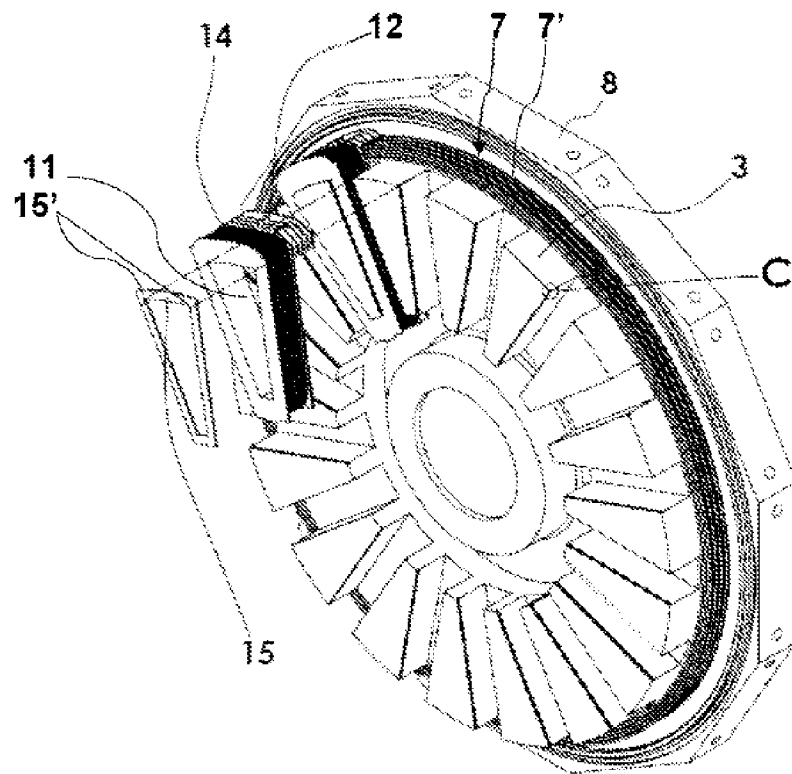


FIG. 3

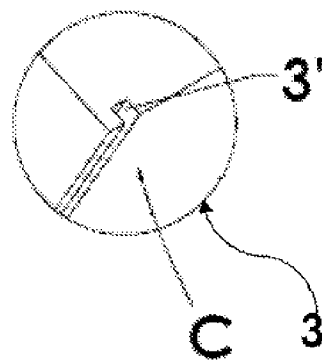


FIG. 4