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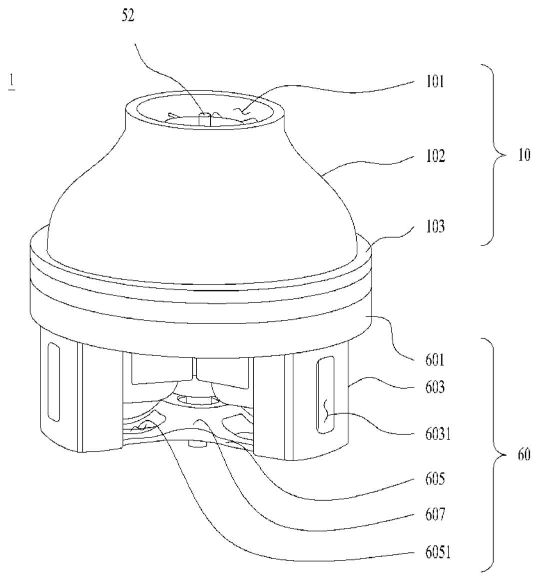

(57) **Abstract:** The present invention relates to a motor assembly comprising a core with an improved structure. An embodiment of the present invention provides a motor assembly comprising: a shaft forming a rotational axis of a motor; a rotor coupled to the shaft; and a plurality of cores provided along the circumference of the rotor and forming a magnetic path. The cores are spaced apart from the outer circumferential surface of the rotor by a predetermined distance and surround at least a portion of the outer circumferential surface of the rotor, and each comprise: a pole shoe having a first surface parallel to the radial direction of the rotor; and a pole arm extending from the pole shoe toward the radially outer side of the rotor. Among the plurality of cores, the first surfaces formed on the pole shoes of adjacent cores are symmetrical with respect to the radial direction of the rotor.

(57) **요약서:** 본 발명은 개선된 구조의 코어를 포함하는 모터 어셈블리에 관한 것이다. 본 발명의 예시적인 실시예는, 모터의 회전축을 형성하는 샤프트와 상기 샤프트에 결합되는 로터 및 상기 로터의 둘레를 따라 구비되어 자로를 형성하는 복수개의 코어를 포함하고, 상기 코어는, 상기 로터의 외주면과 소정간격 이격되어 상기 로터의 외주면 중 적어도 일부를 둘러싸고, 상기 로터의 반경방향에 평행하는 제1 면이 형성되는 폴슈 및 상기 폴슈로부터 상기 로터의 반경방향 외측을 향해 연장되는 폴암을 포함하고, 상기 복수개의 코어 중, 서로 인접한 코어들의 폴슈에 형성된 제1 면은 상기 로터의 반경방향을 기준으로 대칭되는 것을 특징으로 하는 모터 어셈블리를 제공한다.

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MOTOR ASSEMBLY

【Technical Field】

[1] The present disclosure relates to a motor assembly.

【Background】

[2] In general, a motor is a device that implements a driving force by an interaction between a stator and a rotor. Basically, overall structures of the stator and the rotor are the same.

[3] However, types of motors are distinguished based on a principle that the rotor rotates by the interaction between the stator and the rotor. In addition, the types of motors are also distinguished based on a type or a phase of power applied to a stator coil. In addition, the types of motors are also distinguished based on a method the stator coil is wound. For example, there are a DC variable voltage motor, an AC 3-phase induction motor, and the like.

[4] A general structure of the motor will be described. A shaft forming a rotating shaft, the rotor coupled to the shaft, and a stator core fixed inside a housing are arranged, and the stator is installed at a predetermined spacing along a circumference of the rotor.

[5] In addition, teeth are arranged on the stator core, and coils are wound around the teeth so as to form a rotating magnetic field and induce an electrical interaction with the rotor to induce rotation of the rotor.

[6] Coil winding schemes are divided into concentrated winding and distributed winding. The concentrated winding is a winding scheme in which the coils are concentrated and wound in one slot, and the distributed winding is a winding scheme in which the coils are divided and wound in two or more slots.

[7] In the case of the concentrated winding, a copper loss may be reduced while reducing an amount of winding compared to the distributed winding, but a change in magnetic flux density is great and a core loss or an iron loss, that is, a power loss of an iron core increases because the coils are excessively concentrated in the slot. For this reason, the coil wound in the concentrated winding scheme is generally used in a small motor.

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[8] Recently, a motor used in various home appliances (for example, a hair dryer, a vacuum cleaner, and the like) has undergone various developments for securing ease of assembly, securing a flow path area, and solving a spatial constraint that are required in response to a demand for miniaturization and performance improvement.

[9] The cited invention (US16/011823, published on December 20, 2018) discloses a brushless motor including a C-shaped stator core. The C-shaped stator core forms a protrusion for being in contact with a frame to suppress a radial movement. The C-shaped stator core has a structure that may reduce leakage magnetic flux and have a short magnetic flux path.

[10] However, because the C-shaped stator core is composed of two pole arms and a yoke connecting the two pole arms to each other, in order to meet required output of the miniaturized motor, it is necessary to secure a gap between the two pole arms considering a diameter of the coil and the number of turns of the coil.

[11] It is desired to address or ameliorate one or more disadvantages or limitations associated with the prior art, provide a motor assembly, or to at least provide the public with a useful alternative.

[12] Another object may be to provide a structure that may reduce a weight of a motor and secure a space inside the motor by independently constructing a stator core.

[13] Another object may be to provide a C-shaped independent core with an improved structure for increasing an output of a small motor to which the C-shaped independent core is applied.

[14] Another object may be to provide a motor assembly comprising a structure that may secure a slot area for efficiency improvement within a limited diameter when using a C-shaped independent core.

[15] Another object may be to provide a motor assembly that may secure a slot width of a C-shaped independent core as a pole shoe with an improved structure is applied thereto.

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【Summary】

[16] According to a first aspect, the present disclosure may broadly provide a motor assembly comprising a C-shaped independent core with an improved structure that may increase a flux linkage by changing a shape of a pole shoe of the C-shaped independent core, and may secure a slot area.

[17] According to another aspect, the present disclosure may broadly provide a motor assembly comprising a C-shaped independent core with an improved structure that may secure a slot area of the C-shaped independent core by improving a shape such that a curvature of a yoke of the C-shaped independent core corresponds to a curvature of an inner circumferential surface of a motor housing.

[18] According to another aspect, the present disclosure may broadly provide a motor assembly comprising a rotatable shaft, a rotor coupled to the shaft, and a plurality of cores provided along a circumference of the rotor and configured to form a magnetic path, wherein each core comprises pole shoes spaced apart from a circumferential surface of the rotor by a predetermined distance and surrounding at least a portion of the circumferential surface of the rotor, wherein each pole shoe has a first surface formed parallel to a radial direction of the rotor, and pole arms respectively extending from the pole shoes outwardly in the radial direction of the rotor, wherein first surfaces formed in respective pole shoes of adjacent cores among the plurality of cores are symmetrical with each other with respect to the radial direction of the rotor, wherein each pole shoe comprises a second surface extending from a first edge of the first surface toward the respective pole arm extending from the pole shoe, wherein the second surfaces of the adjacent cores form a first angle therebetween, wherein a virtual first line extending along the radial direction of the rotor and passing through a center of a space between the first pole shoe and the second pole shoe and a virtual second line extending along the radial direction of the rotor and passing through a center of a space between the first surfaces of the adjacent cores among the plurality of cores form a second angle therebetween, and wherein the first angle is greater than the second angle.

[19] The pole arms may comprise a first pole arm and a second pole arm spaced apart from the first pole arm to correspond to a width of the core, and the pole shoes may comprise a first pole shoe formed on one side of the first pole arm and a second pole shoe formed on one side of the second pole arm. The core may further comprise a connecting

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portion for connecting the other side of the first pole arm and the other side of the second pole arm to each other.

[20] In one example, the motor assembly may further comprise a motor housing for accommodating the motor therein, and the connecting portion may connect the other side of the first pole arm and the other side of the second pole arm to each other while forming a curvature corresponding to an inner circumferential surface of the motor housing.

[21] Each pole shoe may comprise a second surface extending from one end of the first surface toward each pole arm extending from each pole shoe, and a third surface for forming a curvature corresponding to the circumferential surface of the rotor at the other end of the first surface.

[22] Second surfaces of the adjacent cores among the plurality of cores may form a first angle therebetween, a virtual first line extending along the radial direction of the rotor and passing through a center of a space between the first pole shoe and the second pole shoe and a virtual second line extending along the radial direction of the rotor and passing through a center of a space between the first surfaces of the adjacent cores among the plurality of cores may form a second angle therebetween, and the first angle may be greater than the second angle.

[23] An angle between a virtual first line extending along the radial direction of the rotor and passing through a center of a space between the first pole shoe and the second pole shoe and a virtual second line extending along the radial direction of the rotor and passing through a center of a space between the first surfaces of the adjacent cores among the plurality of cores may be 60 degrees.

[24] In one example, a width of the first surface may be smaller than a width of the pole arm. A coil may be wound on each of the first pole arm and the second pole arm. Alternatively, a coil may be wound on the connecting portion.

[25] According to another aspect, the present disclosure may broadly provide a motor assembly comprising a rotatable shaft, a rotor coupled to the shaft, and a plurality of cores provided along a circumference of the rotor and configured to form a magnetic path, wherein each core comprises pole shoes spaced apart from a circumferential surface of the rotor by a predetermined distance and surrounding at least a portion of the circumferential surface of the rotor, and pole arms respectively extending from the pole shoes outwardly in a radial direction of the rotor, wherein adjacent pole shoes of adjacent cores among the plurality of cores have first surfaces symmetrical to each other with respect to a virtual first line orthogonal to the rotating shaft and passing through a center of a space between the respective adjacent cores, a virtual second line extending along the radial direction of the rotor and passing through a center of a space between the first surfaces of the adjacent cores among the plurality of cores, wherein each pole shoe comprises a second surface extending from a first edge of the first surface toward the respective pole arm extending from the pole shoe, wherein the second surfaces of the adjacent cores form a first angle therebetween, the virtual first line and the virtual second line form a second angle therebetween,, and the first angle is greater than the second angle.

[26] The pole arms may comprise a first pole arm and a second pole arm spaced apart from the first pole arm to correspond to a width of the core, and the pole shoes may comprise a first pole shoe formed on one side of the first pole arm and a second pole shoe formed on one side of the second pole arm. The core may further comprise a connecting portion for connecting the other side of the first pole arm and the other side of the second pole arm to each other.

[27] In one example, the motor assembly may further comprise a motor housing for accommodating the motor therein, and the connecting portion may connect the other side of the first pole arm and the other side of the second pole arm to each other while forming a curvature corresponding to an inner circumferential surface of the motor housing.

[28] Each of the characteristics of the above-described embodiments may be implemented in combination in other embodiments as long as it is not contradictory or exclusive to other embodiments.

[29] According to another aspect, the present disclosure may broadly provide a motor assembly comprising a rotatable shaft, a rotor coupled to the shaft, and a plurality of cores provided along a circumference of the rotor so as to form a magnetic path, wherein each core comprises at least two pole shoes, each pole shoe comprising a first surface parallel to a radial direction of the rotor, a second surface extending from the first surface, and a third surface extending from the first surface and having a curvature corresponding to a circumferential surface of the rotor, at least two pole arms, each pole arm extending outwardly in the radial direction of the rotor from the second surface, and a connecting portion configured to connect the at least two pole shoes and the at least two pole arms to each other, wherein the cores are spaced apart from each other, and wherein first surfaces of adjacent cores are provided to be symmetrical with each other with respect to a virtual second line forming a predetermined angle with a virtual first line orthogonal to the rotatable shaft.

[30] The virtual first line may pass through a center of a space between the pole shoes of one of the plurality of cores.

[31] The second surfaces of the adjacent cores may form a first angle therebetween, the first line and the second line may form a second angle therebetween, and the first angle may be greater than the second angle.

[32] Each core may comprise a first pole shoe disposed at one side thereof and a second pole shoe disposed at a side thereof opposite to the side where the first pole shoe is disposed.

[33] The first pole shoe and the second pole shoe may be arranged to be spaced apart from each other.

[34] The cores may be arranged to be spaced apart from each other at equal spacings.

[34a] According to another aspect, the present disclosure may broadly provide a motor assembly comprising a rotatable shaft, a rotor coupled to the shaft, and a plurality of cores provided along a circumference of the rotor and configured to form a magnetic path, wherein each core comprises: at least two pole shoes, each pole shoe comprising a first surface parallel to a radial direction of the rotor, a second surface extending from the first surface, and a third surface extending from the first surface and having a curvature corresponding to a circumferential surface of the rotor; at least two pole arms, each pole arm extending outwardly in the radial direction of the rotor from the second surface; and a connecting portion configured to connect the at least two pole shoes and the at least two pole arms to each other; wherein the cores are spaced apart from each other, wherein first surfaces of adjacent cores are provided to be symmetrical with each other with respect to a virtual second line forming a predetermined angle with a virtual first line orthogonal to the rotatable shaft, and wherein the virtual first line passes through a center of a space between the pole shoes of one of the plurality of cores.

[35] According to various embodiments of the present disclosure, as the three-phase C-shaped independent core is used, the leakage flux may be reduced and the short magnetic flux path may be comprised. In addition, the area between the pole arm and the pole arm for improving the efficiency may be secured within the limited diameter of the motor housing.

[36] According to various embodiments of the present disclosure, as the structure of the C-shaped independent core is improved, the slot width of the C-shaped independent

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core may be increased, and at the same time, the limited space inside the motor housing may be effectively utilized.

[37] The effects of the present disclosure are not limited to those described above, and other effects not mentioned will be clearly recognized by those skilled in the art from the description below.

[38] The term "comprising" as used in the specification and claims means "consisting at least in part of." When interpreting each statement in this specification that includes the term "comprising," features other than that or those prefaced by the term may also be present. Related terms "comprise" and "comprises" are to be interpreted in the same manner.

[39] The reference in this specification to any prior publication (or information derived from it), or to any matter which is known, is not, and should not be taken as, an acknowledgement or admission or any form of suggestion that that prior publication (or information derived from it) or known matter forms part of the common general knowledge in the field of endeavour to which this specification relates.

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【Brief Description of the Drawings】

[40] FIG. 1 is a perspective view of a motor assembly according to an embodiment of the present disclosure.

[41] FIG. 2 is an exploded perspective view of a motor assembly according to an embodiment of the present disclosure.

[42] FIGS. 3 to 4 are cross-sectional views of a core and a rotor according to an embodiment of the present disclosure.

【Detailed Description】

[43] Hereinafter, a specific embodiment of the present disclosure will be described with reference to the drawings. Following detailed description is provided to provide a comprehensive understanding of a method, an apparatus, and/or a system described herein. However, this is merely an example and the present disclosure is not limited thereto.

[44] In describing embodiments of the present disclosure, when it is determined that a detailed description of a known technology related to the present disclosure may unnecessarily obscure the gist of the present disclosure, the detailed description will be omitted. In addition, terms to be described later, as terms defined in consideration of functions thereof in the present disclosure, may vary based on intentions of users and operators or customs. Therefore, the definition thereof should be made based on the content throughout this specification. Terms used in the detailed description are for illustrating the embodiments of the present disclosure only, and should not be restrictive. Unless explicitly used otherwise, the singular expression comprises the plural expression. Herein, expressions such as “comprising” or “comprising” are intended to indicate certain features, numbers, steps, operations, elements, and some or combinations thereof, and should not be construed to exclude a presence or a possibility of one or more other features, numbers, steps, operations, elements, or some or combinations thereof other than those described.

[45] In addition, in describing components of an embodiment of the present disclosure, terms such as first, second, A, B, (a), (b), and the like may be used. These terms are only for distinguishing the components from other components, and an essence, an order, or a sequence of the corresponding components are not limited by the terms.

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[46] FIG. 1 is a perspective view of a motor assembly according to an embodiment of the present disclosure, and FIG. 2 is an exploded perspective view of a motor assembly according to an embodiment of the present disclosure.

[47] Hereinafter, a description will be made with reference to FIGS. 1 and 2.

[48] A motor assembly 1 according to an embodiment of the present disclosure may be used in small household appliances. As an example, the motor assembly 1 may be used in a vacuum cleaner. There are two types of vacuum cleaners: a canister type in which a nozzle for sucking dust and a dust collector for storing the dust are connected to each other with a hose, and a handy type in which the nozzle and the dust collector are formed as a single module. In the case of the handy type, because cleaning is performed while a user grips the entire cleaner module, overall miniaturization and weight reduction of the vacuum cleaner are required.

[49] The motor assembly 1 may be applied to the small home appliances to meet the above-mentioned needs.

[50] The motor assembly 1 of the present embodiment may comprise a shroud 10, an impeller 20, a diffuser 30, a housing cover 40, a core assembly 5, and a motor housing 60.

[51] The shroud 10 may suck and guide external air. In addition, the shroud 10 may form an upper outer appearance of the motor assembly.

[52] The shroud 10 may comprise a sucking portion 101, an inclined portion 102, and a third coupling portion 103. The sucking portion 101 may be formed in a hollow ring shape at an upper end of the shroud 10. Because the external air is introduced via the sucking portion 101, a diameter of the sucking portion 101 may be designed in consideration of a diameter of the impeller 20.

[53] The shroud 10 may comprise the inclined portion 102 extending while forming a gentle curve from the sucking portion 101. The inclined portion 102 may be formed in a shape in which a diameter thereof increases from the sucking portion 101 in an axial direction. The inclined portion 102 may form the gentle curve in order to minimize an element that may act as a resistance to a flow of air introduced via the sucking portion 101.

[54] The sucking portion 101 may be formed at one end of the inclined portion 102, and the third coupling portion 103 may be formed at the other end of the inclined portion 102. The third coupling portion 103 may extend outwardly in a radial direction from the other end of the inclined portion 102 to have a predetermined thickness. The third coupling portion 103 may be in contact with one surface of a second coupling portion 403 of a housing cover 40 to be described later to allow the shroud 10 and the housing cover 40 to be coupled to each other. In one example, various structures for coupling of the third coupling portion 103 and the second coupling portion 403 may be applied within the thickness of the third coupling portion 103.

[55] The impeller 20 may comprise a through-hole 20a, a blade 203, and an impeller body 201. The impeller 20 may be installed at one side of a shaft 52. In more detail, the impeller 20 may be installed at a side opposite to the other side of the shaft 52 where a rotor 53 is installed based on an axial direction of the shaft 52.

[56] As the shaft 52 forming a rotating shaft of a motor is coupled to the through-hole 20a, the impeller 20 may be fixed at one side of the shaft 52. The impeller 20 may be fixed to the shaft 52 in various schemes, for example, by a screw fastening scheme.

[57] The impeller body 201 may be formed in a shape in which a circumference increases along the axial direction of the shaft 52. The blade 203 may extend outwardly in the radial direction of the shaft 52 from an outer surface of the impeller body 201. The blade 203 may be disposed along a longitudinal direction of the impeller body 201. The blades 203 may be disposed to be spaced apart from each other along a circumferential direction on the outer surface of the impeller body 201.

[58] The impeller 20 of the present embodiment may be formed as a mixed flow impeller that sucks in gas such as air in the axial direction of the shaft 52 and then discharges the gas in an inclined direction between a centrifugal direction and the axial direction.

[59] That is, the gas flowing into the shroud 10 via the sucking portion 101 may be guided to the motor housing 60 along the outer surface of the impeller body 201 by rotation of the blade 203. However, embodiments of the present disclosure are not limited thereto. The impeller 20 may be formed as a centrifugal impeller that sucks in gas in the axial direction and discharges the gas in a centrifugal direction. However, in the following, for convenience of illustration, the case in which the impeller 20 is the mixed flow impeller will be mainly described.

[60] The diffuser 30 may comprise a through-hole 30a, a fastening hole 30b, a diffuser body 301, and a vane 303. The diffuser 30 may convert a dynamic pressure of the gas passing through the impeller 20 into a static pressure.

[61] The diffuser 30 may be coupled to the shaft 52 by inserting the shaft 52 into the through-hole 30a, and the diffuser 30 may be disposed between the impeller 20 and the rotor 53. Therefore, the through-hole 30a may be defined at a position in communication with the through-hole 20a of the impeller 20 when the impeller 20 and the diffuser 30 are coupled to the shaft 52. In addition, the fastening hole 30b is a component for coupling the diffuser 30 to the housing cover 40.

[62] The diffuser body 301 may be formed in a shape in which a circumference increases along the axial direction of the shaft 52. The vane 303 may extend outwardly in the radial direction of the shaft 52 from an outer surface of the diffuser body 301. The vane 303 may be disposed along a longitudinal direction of the diffuser body 301. The vanes 303 may be disposed to be spaced apart from each other in the circumferential direction on the outer surface of the diffuser body 301.

[63] Based on such structure, the gas flowing into the shroud 10 via the sucking portion 101 may be guided to a space between the shroud 10 and the diffuser 30 by the impeller 20, and the gas flowing into the space between an inner surface of the shroud 10 and the diffuser 30 may be guided toward the core assembly 5 by the plurality of vanes 303.

[64] The housing cover 40 may comprise a through-hole 40a, a fastening hole 40b, a second bearing housing 401, a second bridge 402, and a second coupling portion 403.

[65] The through-hole 40a is a component into which the shaft 52 is inserted. The through-hole 40a may be defined at a position in communication with the through-hole 20a of the impeller and the through-hole 30a of the diffuser when the housing cover 40, the diffuser 30, and the impeller 20 are coupled to the shaft 52.

[66] The fastening hole 40b is a component for coupling the diffuser 30 and the housing cover 40 to each other. The fastening hole 40b may be defined at a position in communication with the fastening hole 30b of the diffuser when the diffuser 30 is coupled to the housing cover 40.

[67] The second bearing housing 401 is a component for accommodating therein a second bearing 50 for supporting one side of the shaft 52. It is preferable that the second bearing housing 401 is disposed at a center of the housing cover 40. The second bearing 50 may be, for example, a ball bearing, and the shaft 52 may have a step recessed inwardly in the radial direction in the outer surface thereof so as to support the second bearing 50. Alternatively, in one example, the shaft 52 may have a step protruding outwardly in the radial direction from the outer surface thereof so as to support the second bearing 50.

[68] The second coupling portion 403 extends outwardly in the radial direction of shaft 52 to have a predetermined thickness. One surface of the second coupling portion 403 may be in contact with the third coupling portion 103 of the shroud 10, and the other surface of the second coupling portion 403 may be in contact with a first coupling portion 601 of the motor housing 60 to couple the shroud 10, the housing cover 40, and the motor housing 60 to each other. In one example, various structures for the coupling described above may be applied within the thickness of the second coupling portion 403.

[69] The second bridge 402 connects the second bearing housing 401 and the second coupling portion 403 to each other. A plurality of second bridges 402 may be arranged for structural stability of the housing cover 40, and may be formed to have a predetermined thickness so as to secure rigidity thereof.

[70] When the plurality of second bridges 402 are arranged while having the predetermined thickness, the plurality of second bridges 402 may act as the resistance to the flow of the external air introduced via the sucking portion 101. Therefore, the second bridge 402 of the present embodiment forms a predetermined inclination along the longitudinal direction of the shaft 52. As the second bridge 402 is inclined, a portion acting as the resistance to the flow of the external air introduced via the sucking portion 101 may be minimized. In addition, by guiding the flow toward the core assembly 5, a heat generated as a current flows through a coil 56 may be cooled.

[71] In one example, the diffuser 30 may be formed integrally with the housing cover 40. However, preferably, after being manufactured separately from the housing cover 40, the diffuser 30 may be fastened with the housing cover 40.

[72] The rotor 53 may surround a portion of the outer surface of the shaft 52. The shaft 52 may rotate by an electromagnetic interaction between the rotor 53 and the core assembly 5. As the shaft 52 rotates, the impeller 20 fastened to the shaft 52 may also rotate together with the shaft 52. As the impeller 20 rotates, the external air may be sucked into the motor assembly 1.

[73] The core assembly 5 may comprise a core 54, insulators 55a and 55b, and the coil 56. It is exemplified that the motor of the present embodiment is a brushless direct current motor (BLDC motor). Therefore, the core assembly 5 of the present embodiment may be disposed outwardly of the rotor 53.

[74] The core 54 is disposed along a circumference of the rotor 53 so as to form a magnetic path, and a plurality of cores may be arranged. The core 54 of the present embodiment is an independent C-shaped core formed by two pole arms that are spaced apart from each other and extend in the radial direction of the shaft 52 and a yoke for connecting the two pole arms to each other.

[75] The insulators 55a and 55b may be coupled to the core 54 to surround the pole arms and the yoke of the core 54 and insulate the core 54 and the coil 56 from each other. The insulators may be formed as a first insulator 55a and a second insulator 55b so as to be easily assembled to the core 54.

[76] The motor housing 60 may comprise the first coupling portion 601, a core support 603, a first bridge 605, and a first bearing housing 607.

[77] The first coupling portion 601, as a component to be coupled to the second coupling portion 403 of the housing cover 40 as described above, may be formed in a hollow ring shape. In addition, the core assembly 5 may be coupled to the motor housing 60 along the axial direction of the shaft 52 while extending through the first coupling portion 601.

[78] The core support 603, as a component to support the core assembly 5, may extend along the longitudinal direction of the shaft 52 from the first coupling portion 601. A seating groove 6033 may be defined in a surface of the core support 603 facing the shaft 52. The core assembly 5 may be accommodated in the seating groove 6033.

[79] A second hole 6031 may be defined in the core support 603. The heat generated as the current flows through the coil 56 may be dissipated via the second hole 6031, or the external air introduced via the sucking portion 101 may be discharged through the second hole 6031 via the core assembly 5, thereby cooling the core assembly 5.

[80] The first bearing housing 607 is a component in which a first bearing 57 for supporting one side of the shaft 52 is accommodated. Therefore, the first bearing housing 607 is preferably formed at a center of the motor housing 60. The first bearing 57 may be, for example, the ball bearing. As the first bearing 57 and the second bearing 50 respectively support both sides of the shaft 52, the shaft 52 may rotate stably.

[81] The first bridge 605 connects the first bearing housing 607 and the core support 603 to each other. A plurality of first bridges 605 may be arranged for structural stability of the motor housing 60, and may be formed to have a predetermined thickness so as to secure rigidity of the second bridge 402.

[82] In addition, the first bridge 605 may have a first hole 6051 defined therein. The first hole 6051 may be defined within the thickness of the first bridge 605. When the plurality of first bridges 605 are arranged while having the predetermined thickness, the plurality of first bridges 605 may act as the resistance to the flow passing through an interior of the motor housing 60 along the longitudinal direction of the shaft 52. Therefore, in the first bridge 605 of the present embodiment, the first hole 6051 is defined along a longitudinal direction of the first bridge 605 to minimize a portion acting as the resistance to the flow, and at the same time, secure the rigidity of the motor housing 60.

[83] FIGS. 3 to 4 are cross-sectional views of a core and a rotor according to an embodiment of the present disclosure. Hereinafter, a description will be made with reference to FIGS. 3 and 4.

[84] The core 54 according to an embodiment of the present disclosure may comprise a plurality of cores along the circumference of the rotor 53. In the present drawing, three independent cores along the circumference of the rotor 53 are illustrated.

[85] The core 54 may comprise a first pole shoe 545 and a second pole shoe 547 that are spaced apart from an outer circumferential surface of the rotor 53 by a predetermined distance to surround at least a portion of the outer circumferential surface of the rotor 53 and form a first surface 5471 parallel to the radial direction of the rotor 53, a first pole arm 541 and a second pole arm 543 extending outwardly in the radial direction of the rotor 53 from the pole shoes 545 and 547, respectively, and a connecting portion 542 for connecting the first pole arm 541 and the second pole arm 543 to each other.

[86] That is, the core 54 of the present embodiment is an independent C-shaped core comprising the two pole arms, a yoke for connecting the other sides of the pole arms to each other, and the pole shoes respectively formed on one sides of the pole arms. Therefore, the first pole arm 541 and the second pole arm 543 are spaced apart from each other corresponding to a width 54w of the core.

[87] The pole shoe may be formed of the first surface 5471, a second surface 5472, and a third surface 5473. The first surface 5471 may be formed parallel to the radial direction of the rotor 53. More specifically, referring to (b) in FIG. 3, the first surface 5471 may extend along the radial direction of the rotor 53 and be formed parallel to a virtual second line L2 passing through a center of the rotor 53. The second line L2, as a virtual reference line orthogonal to the rotating shaft of the shaft, may be defined as a line passing through a center of a space between first surfaces of adjacent cores among the plurality of cores.

[88] In addition, a width of the first surface 5471 is preferably smaller than a width of the pole arm. Because when the width of the first surface 5471 is greater than the width of the pole arm, the width of the first surface 5471 should be directed toward the second surface 5472 when considering the predetermined distance at which the pole shoe and the rotor 53 are spaced apart from each other, which may increase leakage flux between the adjacent cores.

[89] Accordingly, the width of the first surface 5471 may be smaller than the width of the pole arm, and accordingly, the second surface 5472 may extend from one end of the first surface 5171 toward the pole arm in a straight line. In addition, the third surface 5173 may form a curvature corresponding to the circumferential surface of the rotor 53 at the other end of the first surface 5171.

[90] Relationships between the respective pole shoes and the respective pole arms of the adjacent cores will be described with reference to (b) in FIG. 3. The respective first surfaces of the cores may be formed symmetrical with each other with respect to the second line L2. More specifically, as the plurality of cores are arranged along the circumference of the rotor, a first pole shoes 545a of one of the among the plurality of cores may be disposed adjacent to a second pole shoe 547b of one of the remaining cores. Because the plurality of cores have the same shape and configuration, the cores will be distinguished from each other using “a” and “b” below to identify a component of each core.

[91] As described above, the first pole shoe 545a and the second pole shoe 547b are spaced apart from the rotor 53 by the predetermined distance and are disposed adjacent to each other along the circumference of the rotor 53. A first surface 5471a of the first pole shoe may be disposed symmetrically to a first surface 5471b of the second pole shoe, and, may be preferably parallel to the second line L2. As the surfaces parallel to each other and facing each other are formed between the pole shoes of the adjacent cores as described above, the width 54W of the core may be increased while maintaining a flux linkage between the cores.

[92] In addition, a first angle A1 is formed between a second surface 5472a of the first pole shoe and a second surface 5472b of the second pole shoe.

[93] The first angle A1 may be larger than a second angle A2 to be described later. The second angle A2 may be defined as an angle between a virtual first line L1 and the second line L2 extending along the radial direction of the rotor while passing through a center of a space between the first pole shoe 545 of one of the plurality of cores and the second pole shoe 547. The first line L1, as a virtual reference line orthogonal to the rotating shaft of the shaft, may be defined as a line passing through a center of the space between the first pole shoe 545 and the second pole shoe 547 of the cores.

[94] In the present embodiment, the second angle A2 may preferably be 60 degrees. This is because the core of the present embodiment preferably has the three independent cores at equal spacings along the circumference of the rotor.

[95] In one example, the connecting portion 542 may connect the other side of the first pole arm 541 and the other side of the second pole arm 543 to each other while forming a curvature corresponding to an inner circumferential surface of the motor housing

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60. As the connecting portion 542 is formed with the curvature corresponding to the inner circumferential surface of the motor housing 60, the winding area WA of the core 54 may be further secured. In addition, unnecessary gaps that may occur in the connecting portion and the inner circumferential surface of the motor housing when the connecting portion connects the two pole arms to each other in a straight line may be prevented.

[96] That is, as in the present embodiment, the connecting portion 542 may form the curvature corresponding to the inner circumferential surface of the motor housing 60, thereby not only effectively utilizing the inner space of the motor assembly, but also securing the winding area WA of the core.

[97] The winding area WA of the core may mean an area of the coil that may be wound on the core. The area of the coil may be defined differently depending on the number of times the coil is wound on the core and a diameter of the coil. However, as described above, it is important to secure the winding area WA within the limited space for the miniaturization of the motor and the improvement of the motor performance.

[98] As described above, the motor assembly of the present embodiment discloses the core of the improved structure that may secure the winding area WA. In one example, the winding area WA may be set differently depending on the size of the motor, but in a case of a motor of the same size, a width between the pole arm and the pole arm must be widened in order to increase the winding area WA.

[99] In the present embodiment, because the first surfaces of the adjacent pole shoes are symmetrical with each other with respect to the virtual second line L2 and are formed as parallel surfaces, the core width 54W may be effectively secured. In addition, as the connecting portion 542 forms the curvature corresponding to the inner circumferential surface of the motor housing 60, the core width 54W may be secured.

[100] Although various embodiments of the present disclosure have been described in detail above, those with ordinary skill in the technical field to which the present disclosure belongs will understand that various modifications are possible with respect to the above-described embodiments without departing from the scope of the present disclosure. Therefore, the scope of rights of the present disclosure should not be limited to the described embodiments and should be defined by the claims to be described later as well as equivalents thereof.

[101] Although embodiments have been described with reference to a number of illustrative embodiments thereof, it will be understood by those skilled in the art that

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various changes in form and details may be made therein without departing from the spirit and scope of the invention as defined by the appended claims.

[102] Many modifications will be apparent to those skilled in the art without departing from the scope of the present invention as herein described with reference to the accompanying drawings.

【CLAIMS】

1. A motor assembly comprising:

a rotatable shaft;

a rotor coupled to the shaft; and

a plurality of cores provided along a circumference of the rotor and configured to form a magnetic path,

wherein each core comprises:

pole shoes spaced apart from a circumferential surface of the rotor by a predetermined distance and surrounding at least a portion of the circumferential surface of the rotor, wherein each pole shoe has a first surface formed parallel to a radial direction of the rotor; and

pole arms respectively extending from the pole shoes outwardly in the radial direction of the rotor,

wherein the first surfaces formed in respective pole shoes of adjacent cores among the plurality of cores are symmetrical with each other with respect to the radial direction of the rotor;

wherein each pole shoe comprises a second surface extending from a first edge of the first surface toward the respective pole arm extending from the pole shoe,

wherein the second surfaces of the adjacent cores form a first angle therebetween,

wherein a virtual first line extending along the radial direction of the rotor and passing through a center of a space between the first pole shoe and the second pole shoe and a virtual second line extending along the radial direction of the rotor and passing through a center of a space between the first surfaces of the adjacent cores among the plurality of cores form a second angle therebetween, and

wherein the first angle is greater than the second angle.

2. The motor assembly of claim 1, wherein the pole arms comprise a first pole arm and a second pole arm spaced apart from the first pole arm to correspond to a width of the core,

wherein the pole shoes comprise a first pole shoe formed on a first end of the first pole arm and a second pole shoe formed on first end of the second pole arm.

3. The motor assembly of claim 2, wherein the core further comprises a connecting portion connecting a second end of the first pole arm and a second end of the second pole arm to each other.

4. The motor assembly of claim 3, further comprising a motor housing configured to accommodate the motor therein,

wherein the connecting portion forms a curvature corresponding to an inner circumferential surface of the motor housing.

5. The motor assembly of any one of claims 1 and 2, wherein each pole shoe further comprises:

a third surface extending from a second edge of the first surface and configured to form a curvature corresponding to the circumferential surface of the rotor.

6. The motor assembly of claim 5, wherein an angle between a virtual first line extending along the radial direction of the rotor and passing through a center of a space between the first pole shoe and the second pole shoe and a virtual second line extending along the radial direction of the rotor and passing through a center of a space between the first surfaces of the adjacent cores among the plurality of cores is 60 degrees.

7. The motor assembly of any one of claims 1 to 6, wherein a width of each first surface is smaller than a width of the corresponding pole arm.

8. The motor assembly of any one of claims 2 to 7, wherein a coil is wound around each of the first pole arms and the second pole arms.

9. The motor assembly of any one of claims 3 to 8, wherein a coil is wound around each of the connecting portions.

10. A motor assembly comprising:

a rotatable shaft;

a rotor coupled to the shaft; and

a plurality of cores provided along a circumference of the rotor and configured to form a magnetic path,

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wherein each core comprises:

pole shoes spaced apart from a circumferential surface of the rotor by a predetermined distance and surrounding at least a portion of the circumferential surface of the rotor; and

pole arms respectively extending from the pole shoes outwardly in a radial direction of the rotor,

wherein adjacent pole shoes of adjacent cores among the plurality of cores have first surfaces symmetrical to each other with respect to a virtual first line orthogonal to the rotating shaft and passing through a center of a space between the respective adjacent cores, a virtual second line extending along the radial direction of the rotor and passing through a center of a space between the first surfaces of the adjacent cores among the plurality of cores,

wherein each pole shoe comprises a second surface extending from a first edge of the first surface toward the respective pole arm extending from the pole shoe,

wherein the second surfaces of the adjacent cores form a first angle therebetween,

wherein the virtual first line and the virtual second line form a second angle therebetween, and

wherein the first angle is greater than the second angle.

11. The motor assembly of claim 10, wherein the pole arms comprise a first pole arm and a second pole arm spaced apart from the first pole arm to correspond to a width of the core,

wherein the pole shoes comprise a first pole shoe formed on a first end of the first pole arm and a second pole shoe formed on a first end of the second pole arm.

12. The motor assembly of claim 11, wherein the core further comprises a connecting portion connecting a second end of the first pole arm and a second end of the second pole arm to each other.

13. The motor assembly of claim 12, further comprising a motor housing configured to accommodate the motor therein,

wherein the connecting portion forms a curvature corresponding to an inner circumferential surface of the motor housing.

14. A motor assembly comprising:

a rotatable shaft;

a rotor coupled to the shaft; and

a plurality of cores provided along a circumference of the rotor and configured to form a magnetic path,

wherein each core comprises:

at least two pole shoes, each pole shoe comprising a first surface parallel to a radial direction of the rotor, a second surface extending from the first surface, and a third surface extending from the first surface and having a curvature corresponding to a circumferential surface of the rotor;

at least two pole arms, each pole arm extending outwardly in the radial direction of the rotor from the second surface; and

a connecting portion configured to connect the at least two pole shoes and the at least two pole arms to each other;

wherein the cores are spaced apart from each other,

wherein first surfaces of adjacent cores are provided to be symmetrical with each other with respect to a virtual second line forming a predetermined angle with a virtual first line orthogonal to the rotatable shaft, and

wherein the virtual first line passes through a center of a space between the pole shoes of one of the plurality of cores.

15. The motor assembly of claim 14, wherein second surfaces of the adjacent cores form a first angle therebetween,

wherein the virtual first line and the virtual second line form a second angle therebetween,

wherein the first angle is greater than the second angle.

16. The motor assembly of claim 14, wherein each core comprises a first pole shoe disposed at one side thereof and a second pole shoe disposed at a side thereof opposite to the side where the first pole shoe is disposed.

17. The motor assembly of claim 16, wherein the first pole shoe and the second pole shoe are spaced apart from each other.

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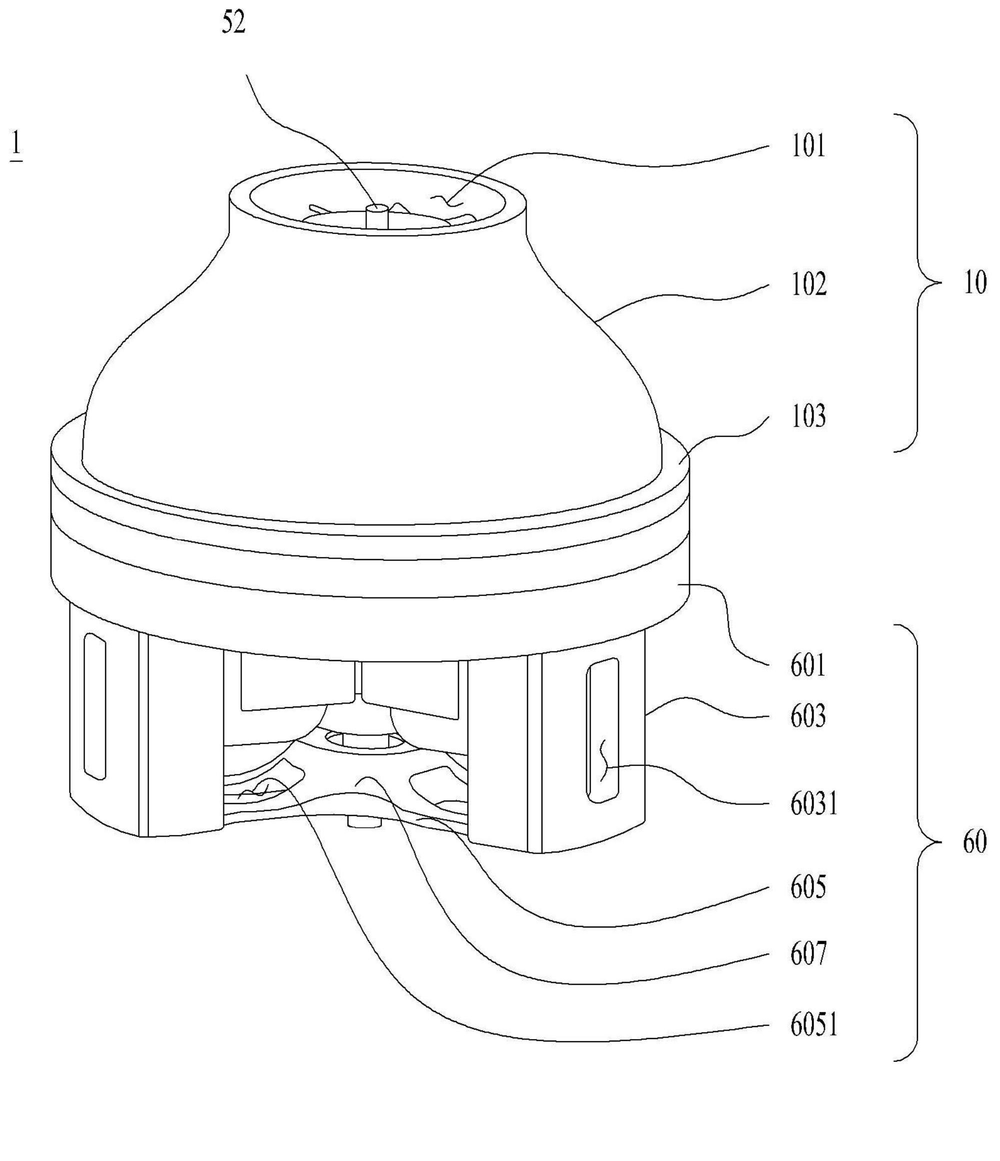
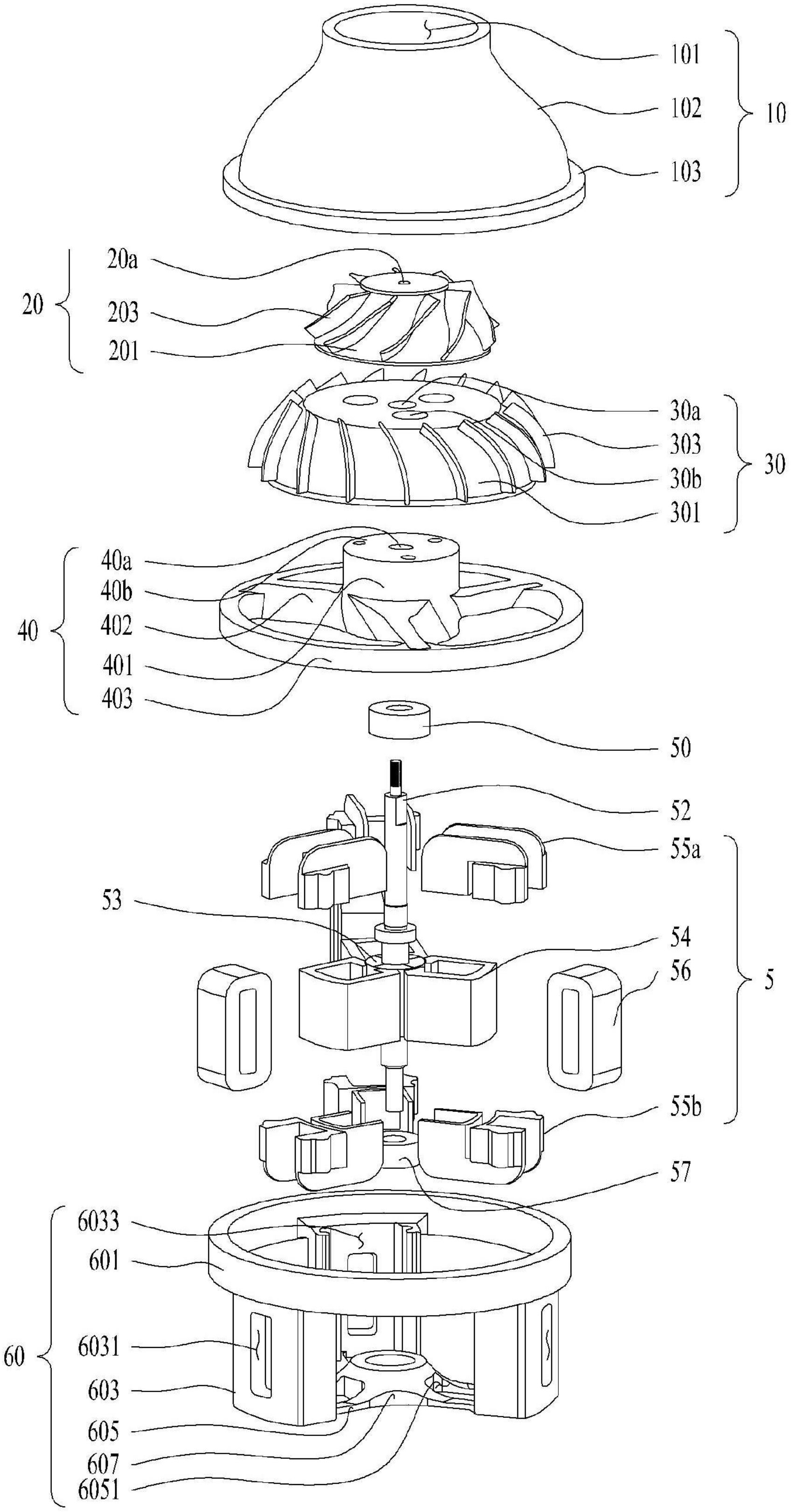
18. The motor assembly of claim 15, wherein the cores spaced apart from each other at equal spacings.

【Fig 1】



【Fig 2】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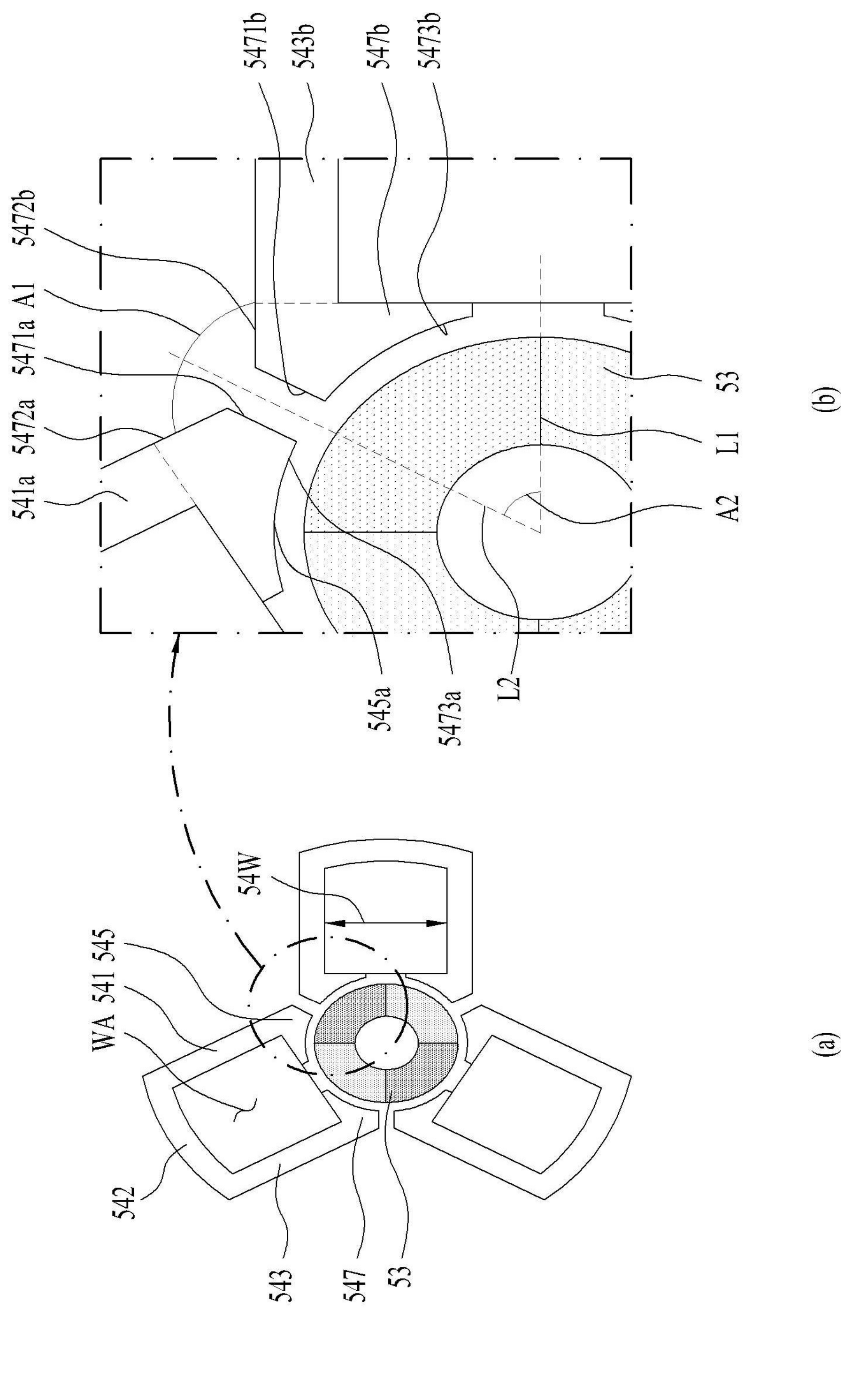
【FIg 3】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547
53
(a)

【FIg 4】