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(54) **SANDING MACHINE**

(57) Provided is a sander. The sander includes a housing; an electric motor at least partially disposed in the housing and used for providing a power source, where the electric motor includes a motor shaft that rotates about a motor axis; a fan assembly including a fan connected to the electric motor; an eccentric element driven by the electric motor, where the eccentric element has a central axis deviating from the motor axis; and a base plate assembly including a base plate, a sanding member fixed to a lower surface of the base plate, and a support for supporting the eccentric element, where the support includes a first end surface and a second end surface opposite to each other, and the second end surface is disposed on a side of the support facing the lower surface relative to the first end surface. The sander further includes a counterweight connected to the eccentric element and driven by the electric motor to rotate about the central axis. The ratio of the distance from the centroid of the counterweight to the lower surface of the base plate to the distance from the first end surface of the support to the lower surface of the base plate is greater than or equal to 0.2 and less than or equal to 0.4.

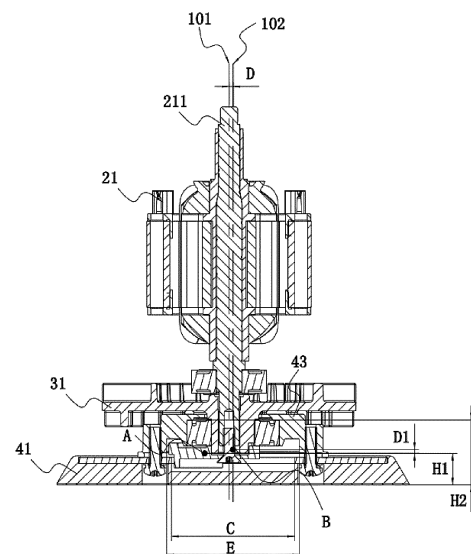


Fig. 3

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Description

[0001] This application claims priority to Chinese Patent Application No. 202011298291.9 filed Nov. 19, 2020, the disclosures of which is incorporated herein by reference in its entirety.

TECHNICAL FIELD

[0002] The present application relates to a power tool, for example, a sander.

BACKGROUND

[0003] As a type of sanding and polishing tool, a sander is more and more popular. Functionally, the sander is mainly used for cleaning, dehairing, and polishing surfaces in machinery, architectural decoration, and furniture painting. Structurally, the sander generally includes a housing, an electric motor, a fan assembly, an eccentric element, a base plate assembly, and the like. The housing is used for accommodating the electric motor, the fan assembly, and the eccentric element. The base plate assembly is at least partially disposed outside the housing. The base plate assembly is used for connecting sandpaper. The eccentric element drives the base plate assembly to move about a motor axis of the electric motor so that the sandpaper sands and polishes a workpiece to be sanded. The fan assembly is used for generating a dust collection airflow and a heat dissipation airflow when the electric motor operates.

[0004] To reduce the vibration generated when the sander operates, the sander is often provided with a balancing structure for balancing the base plate assembly. When the balancing structure is provided, to facilitate installation and simplify the structure, the balancing structure is directly fixedly connected to or integrally formed with the eccentric element and/or the fan assembly. However, such an arrangement tends to make the centroid of the balancing structure higher, and then the distance between the centroid of the balancing structure and the centroid of the base plate assembly increases, increasing the torque between the centroids. An additional counterweight needs to be added to balance the torque and ensure the smooth operation of the sander, increasing the weight of the sander and affecting the hand feeling of operation of the sander.

SUMMARY

[0005] The present application provides a lightweight sander.

[0006] The present application adopts the technical solutions described below. A sander includes a housing; an electric motor at least partially disposed in the housing and used for providing a power source, where the electric motor includes a motor shaft that rotates about a motor axis; a fan assembly including a fan connected to the

electric motor; an eccentric element driven by the electric motor, where the eccentric element has a central axis separated from the motor axis; and a base plate assembly including a base plate and a support for supporting the eccentric element, where the support includes a first end surface and a second end surface opposite to each other, and the second end surface is closer to a lower surface than the first end surface. The sander further includes a counterweight connected to the eccentric element and driven by the electric motor to rotate about the central axis. The ratio of the distance from the centroid of the counterweight to the lower surface of the base plate to the distance from the first end surface of the support to the lower surface of the base plate is greater than or equal to 0.2 and less than or equal to 0.4.

[0007] The counterweight includes a body connected to the eccentric element; and a centroid adjustment portion for adjusting the centroid of the counterweight; where the centroid adjustment portion is fixedly connected to or integrally formed with the body.

[0008] The base plate assembly further includes a support base for mounting the support, where the support base is fixedly connected to the base plate and includes a bypass groove allowing the counterweight to rotate.

[0009] The base plate includes a groove allowing the counterweight to move, and the counterweight at least partially overlaps with the base plate in an axial direction.

[0010] The groove is a circular groove, the center of the groove is located on the central axis, and the ratio of the inner diameter of the groove to the outer diameter of the base plate is greater than or equal to 0.25 and less than or equal to 0.4.

[0011] The counterweight includes a weight increasing portion and a weight reducing portion, where the weight reducing portion is disposed on a side of the counterweight facing the base plate, and the weight increasing portion is disposed on a side of the counterweight facing the fan.

[0012] The counterweight includes a weight increasing portion and a weight reducing portion, where the weight reducing portion is disposed on a side of the counterweight facing the fan, and the weight increasing portion is disposed on a side of the counterweight facing the base plate.

[0013] The product of the weight of the fan and the square of the outer diameter of the fan is greater than or equal to 40 kg/cm² and less than or equal to 200 kg/cm².

[0014] The ratio of the weight of the fan to the mass of the electric motor is greater than or equal to 3% and less than or equal to 25%.

[0015] Further provided is a sander. The sander includes a housing; an electric motor at least partially disposed in the housing and used for providing a power source, where the electric motor includes a motor shaft that rotates about a motor axis; a fan assembly including a fan connected to the electric motor; an eccentric element driven by the electric motor, where the eccentric element has a central axis deviating from the motor axis;

and a base plate assembly including a base plate, a sanding member fixed to a lower surface of the base plate, and a support for supporting the eccentric element, where the support includes a first end surface and a second end surface opposite to each other, and the second end surface is disposed on a side of the support facing the lower surface relative to the first end surface. The sander further includes a counterweight connected to the eccentric element and driven by the electric motor to rotate about the central axis. The ratio of the distance from the centroid of the counterweight to the lower surface of the base plate to the distance from the first end surface of the support to the lower surface of the base plate is greater than or equal to 0.2 and less than or equal to 0.4. The product of the weight of the fan and the square of the outer diameter of the fan is greater than or equal to 40 kg/cm² and less than or equal to 200 kg/cm².

[0016] The fan is located on the upper side of the counterweight along the direction of the motor axis, where the density of the fan is less than 6.5 g/cm³.

[0017] The base plate includes a groove allowing the counterweight to move, and the counterweight at least partially overlaps with the base plate in an axial direction.

[0018] The groove is a circular groove coaxial with the central axis, and the ratio of the inner diameter of the groove to the outer diameter of the base plate is greater than or equal to 0.25 and less than or equal to 0.4.

[0019] The ratio of the weight of the fan to the mass of the electric motor is greater than or equal to 3% and less than or equal to 25%.

[0020] The counterweight includes a weight increasing portion and a weight reducing portion, where the weight reducing portion is disposed on a side of the counterweight facing the base plate, and the weight increasing portion is disposed on a side of the counterweight facing the fan.

[0021] The counterweight includes a weight increasing portion and a weight reducing portion, where the weight reducing portion is disposed on a side of the counterweight facing the fan, and the weight increasing portion is disposed on a side of the counterweight facing the base plate.

[0022] In the present application, the centroid of the counterweight is adjacent to the lower surface of the base plate so that the torque between the centroid of the counterweight and the centroid of the base plate assembly is reduced, the weight of the counterweight is reduced, and the weight of the sander is reduced.

BRIEF DESCRIPTION OF DRAWINGS

[0023]

FIG. 1 is a perspective view of a sander according to the present application;

FIG. 2 is a plan view of a power assembly, a fan assembly, and a base plate assembly of the sander

shown in FIG. 1;

FIG. 3 is a sectional view of the structure shown in FIG. 2 taken along a motor axis;

FIG. 4 is an exploded view of the structure shown in FIG. 2;

FIG. 5 is an exploded view of the structure shown in FIG. 2 from another perspective;

FIG. 6 is a perspective view of a fan in the structure shown in FIG. 4;

FIG. 7 is a perspective view of a fan in the structure shown in FIG. 4 from another perspective;

FIG. 8 is a perspective view of a counterweight in the structure shown in FIG. 4; and

FIG. 9 is a perspective view of a counterweight in the structure shown in FIG. 4 from another perspective.

DETAILED DESCRIPTION

[0024] FIG. 1 shows a sander 100 that can drive a functional element to move, where the functional element may be sandpaper so that the sander 100 can sand and smooth surfaces of workpieces of various materials through the functional element.

[0025] It is to be understood that the sander 100 may specifically include round sandpaper, triangular sandpaper, square sandpaper, and so on. To clearly describe the technical solutions of the present application, the round sander is used as an example in the present application.

[0026] For ease of description, up, down, front, rear, left, and right as shown in FIG. 1 are defined.

[0027] As shown in FIGS. 1 to 5, the sander 100 includes a housing 10, a switch 111, a base plate assembly 40, a power assembly 20, a fan assembly 30, an eccentric element 50, and an energy source (not shown in the figure).

[0028] As the appearance of the sander 100, the housing 10 is formed with at least a handle portion 110, an accommodation portion 120, and a bracket portion 130. The handle portion 110 is used for a user to hold, where an end of the handle portion 110 is connected to the accommodation portion 120, and the other end of the handle portion 110 may be used for connecting an external power cable or may form a connecting seat for mounting a portable direct current power supply such as a battery pack. The accommodation portion 120 is located between the handle portion 110 and the bracket portion 130, an accommodation cavity is formed inside the accommodation portion 120, and the power assembly 20 is at least partially disposed in the accommodation cavity.

The bracket portion 130 is used for covering the fan assembly 30 and at least part of the base plate assembly 40.

[0029] The switch 111 may be mounted on the housing 10. Specifically, the switch 111 is mounted on the handle portion 110 so that it is relatively convenient to trigger the switch 111 when the user holds the handle portion 110.

[0030] The power assembly 20 includes an electric motor 21, where the electric motor 21 is used as a prime mover of the sander 100 and disposed in the housing 10. The electric motor 21 includes a motor shaft 211 for transmitting power to the fan assembly 30, and the motor shaft 211 rotates about a motor axis 101. The motor axis 101 extends basically along an up and down direction.

[0031] The fan assembly 30 includes a fan 31 that can be driven by the motor shaft 211 to rotate about the motor axis 101, and the fan 31 can generate an airflow when the fan 31 is driven by the motor shaft 211 to rotate.

[0032] The eccentric element 50 surrounds the motor shaft 211, and the eccentric element 50 is eccentrically disposed relative to the motor shaft 211. The eccentric element 50 is mounted to the motor shaft 211 and fixedly connected to the motor shaft 211. It is to be noted that the eccentric element 50 being eccentrically disposed relative to the motor shaft 211 means that the eccentric element 50 has a central axis 102, and the central axis 102 is parallel to the motor axis 101 of the motor shaft 211 and has a distance D from the motor axis 101 of the motor shaft 211. The distance D exists so that when the motor shaft 211 rotates, the eccentric element 50 can transmit the rotation of the motor shaft 211 into the rotation and revolution of other components connected to the eccentric element 50.

[0033] The motor shaft 211 can drive the base plate assembly 40 so that the base plate assembly 40 can swing relative to the housing 10. Specifically, the base plate assembly 40 is fixedly connected to the eccentric element 50, that is to say, the motor shaft 211 transmits power to the base plate assembly 40 through the eccentric element 50. The base plate assembly 40 includes a base plate 41, the base plate 41 includes an upper surface 411 and a lower surface 412 opposite to each other, the lower surface 412 is disposed on a side of the base plate 41 facing away from the eccentric element 50 relative to the upper surface 411, and the lower surface 412 is used for mounting the functional element such as the sandpaper. Driven by the motor shaft 211 and the eccentric element 50, the base plate 41 can move eccentrically. When the base plate 41 moves eccentrically, the surface of a workpiece to be sanded can be continuously rubbed with the sandpaper, thereby implementing the function of sanding and polishing the workpiece to be sanded.

[0034] The energy source is used for providing a source of energy to the sander 100. The energy source may be an alternating current or a direct current such as the battery pack or another portable mobile power supply. In this example, the energy source adopts the alternating

current.

[0035] As shown in FIGS. 4 and 5, the base plate assembly 40 further includes a support 42 and a support base 43. The support 42 is used for reducing a friction coefficient during the rotation of the motor shaft 211 and the eccentric element 50 disposed on the motor shaft 211, thereby ensuring the rotational accuracy and parallelism of the motor shaft 211. The support 42 is sleeved on the eccentric element 50 and fixedly connected to the eccentric element 50. Specifically, the support 42 is a rolling bearing, where the rolling bearing 42 includes an outer race, an inner race, and balls. The inner race is sleeved on the motor shaft 211 and fixedly connected to the motor shaft 211. The outer race is fixedly connected to the support base 43 and is disposed around the inner race. The balls are arranged between the outer race and the inner race and are used for enabling the outer race to move relative to the inner race.

[0036] The support base 43 is used for mounting the support 42. The support base 43 is fixedly connected to the outer race of the support 42, that is, the outer race of the support 42 is synchronously connected to the support base 43. The support base 43 is fixedly connected to the base plate 41, that is to say, the base plate 41 can move synchronously with the support base 43 and the outer race of the support 42.

[0037] As shown in FIGS. 4, 5, 8, and 9, the sander 100 further includes a balancing assembly 60 for balancing the base plate assembly 40. The balancing assembly 60 includes a counterweight 61 located between the fan 31 and the base plate 41 along the direction of the motor axis 101, and the counterweight 61 is detachably and fixedly connected to the eccentric element 50. That is to say, the eccentric element 50 moves synchronously with the counterweight 61 and the counterweight 61 can rotate with the eccentric element 50 about the central axis 102. It is to be noted that the counterweight 61 being detachably and fixedly connected to the eccentric element 50 means that the counterweight 61 and the eccentric element 50 are two separable parts and can be fixed together through a screw connection, a threaded connection, or a snap connection to rotate synchronously. In the present application, the counterweight 61 and the eccentric element 50 are connected using a screw. Specifically, the balancing assembly 60 includes at least one fixing member, and the fixing member is specifically a positioning screw. The positioning screw penetrates through a connecting hole of the counterweight 61 so that the counterweight 61 abuts against the inner race of the support 42, and finally, the counterweight 61 is locked to the eccentric element 50, thereby achieving the synchronous rotation of the counterweight 61 and the eccentric element 50. It may also be understood as that the fixing member penetrates through the connecting hole of the counterweight 61 from a side of the counterweight 61 facing the base plate 41 so that the counterweight 61 is fixed to the eccentric element 50, that is, the counterweight 61 rotates synchronously with the eccentric element 50.

ment 50. The counterweight 61 supports the inner race of the support 42, that is to say, the inner race of the support 42 can be prevented from being disengaged from the outer race of the support 42 during the operation of the sander 100 without an additional positioning retainer ring, thereby simplifying the structure and making the structure of the whole machine more compact.

[0038] In this example, the support 42 includes a first end surface 421 and a second end surface 422 opposite to each other, where the second end surface 422 is disposed on a side of the support 42 facing the lower surface 412 of the base plate 41 relative to the first end surface 421. That is to say, the first end surface 421 is disposed on the upper side of the second end surface 422 along the direction of the motor axis 101. The ratio of the distance H1 from the centroid A of the counterweight 61 to the lower surface 412 of the base plate 41 to the distance H2 from the first end surface 421 of the support 42 to the lower surface 412 of the base plate 41 is greater than or equal to 0.2 and less than or equal to 0.4. The centroid A of the counterweight 61 is adjacent to the base plate 41, and the position of the centroid A of the counterweight 61 is set within the preceding range so that the centroid A of the counterweight 61 is adjacent to the centroid B of the base plate assembly 40. In this manner, the distance between the centroid A of the counterweight 61 and the centroid B of the base plate assembly 40 can be reduced, thereby greatly reducing the weight of the counterweight 61 and reducing the weight of the entire sander 100.

[0039] As shown in FIG. 3, the centroid A of the counterweight 61 is located between the base plate 41 and the support 42, where the distance D1 from the centroid A of the counterweight 61 to the centroid B of the base plate assembly 40 along the direction of the motor axis 101 is greater than or equal to 0 mm and less than or equal to 2 mm. The counterweight 61 is used for achieving a double balance of mass balance and torque balance of the base plate assembly 40. Through the preceding arrangement, the centroid A of the counterweight 61 is adjacent to the centroid B of the base plate assembly 40, the distance from the centroid A of the counterweight 61 to the centroid B of the base plate assembly 40 is reduced, and the torque between the centroids is reduced. That is, the counterweight 61 can reduce the weight for balancing torque. It may also be understood as that no additional weight is required to balance the torque so that the following case can be avoided: the weight of the counterweight 61 is added to balance other weights. In other words, the torque can be counteracted simply through the configuration of other very light weights, and thus only an additional weight having the same weight as the other weights needs to be configured on the counterweight 61. Therefore, it can be seen that through the preceding arrangement, the weight of the counterweight 61 can be greatly reduced, thereby reducing the weight of the sander 100, facilitating user operation, reducing the weight of the whole machine, and reducing the fatigue

of the user. The distance D1 from the centroid A of the counterweight 61 to the centroid B of the base plate assembly 40 is greater than or equal to 0 mm and less than or equal to 1 mm. The distance D1 within the preceding range ensures a better effect.

[0040] The counterweight 61 includes a body 63 and a centroid adjustment portion 62. The body 63 is connected to the eccentric element. The centroid adjustment portion 62 is used for adjusting the centroid of the counterweight 61, and the centroid adjustment portion 62 is fixedly connected to or integrally formed with the body 63. In this example, the centroid adjustment portion 62 is integrally formed with the body 63. Specifically, the centroid adjustment portion 62 includes a weight increasing portion and a weight reducing portion, where the weight increasing portion is used for increasing the weight of the counterweight 61, and the weight reducing portion is used for reducing the weight of the counterweight 61. The weight reducing portion is disposed on a side of the counterweight 61 facing the base plate 41, and the weight increasing portion is disposed on a side of the counterweight 61 facing the fan 31. Of course, as another example, the weight reducing portion is disposed on the side of the counterweight 61 facing the fan 31, and the weight increasing portion is disposed on the side of the counterweight 61 facing the base plate 41. Through the preceding arrangement, that is, the centroid adjustment portion 62 is disposed on the counterweight 61, the weight increasing portion and the weight reducing portion may be adjusted according to the weight and eccentricity of the base plate assembly 40, so as to adjust the position of the centroid and achieve the mass balance and torque balance of the base plate assembly 40. For example, the centroid adjustment portion 62 extending upward for increasing the weight of the counterweight 61 is provided, or the centroid adjustment portion 62 extending downward for reducing the weight of the counterweight 61 is provided.

[0041] As shown in FIGS. 3 to 5, the counterweight 61 is located between the support base 43 and the base plate 41, and the counterweight 61 is at least partially disposed within the base plate 41. The counterweight 61 includes a first surface 611 and a second surface 612 opposite to each other, where the first surface 611 faces away from the base plate 41 relative to the second surface 612, and the second surface 612 is located on the lower side of the fixing member along the direction of the motor axis 101. That is to say, the first surface 611 at least partially abuts against the inner race of the support 42, and the second surface 612 is adjacent to the upper surface 411 of the base plate 41. The upper surface 411 of the base plate 41 is recessed downward to form a groove 413 in which the counterweight 61 is movable, and the second surface 612 of the counterweight 61 extends toward a direction in which the groove 413 is recessed, that is to say, the counterweight 61 partially overlaps with the base plate 41 in an axial direction. In this example, the groove 413 is a circular groove coaxial with

the central axis 102, and the ratio of the inner diameter of the groove 413 to the outer diameter of the base plate 41 is greater than or equal to 0.25 and less than or equal to 0.4. The radius C of the groove 413 is greater than or equal to 16 mm and less than or equal to 50 mm. On the one hand, the radius C of the groove 413 is set within the preceding reasonable range so that it is ensured that the counterweight 61 has enough space for movement, and the following case is avoided: the radius of the groove 413 is so large that a dimension of a transmission assembly in a radial direction is increased. On the other hand, the groove 413 recessed downward is provided on the base plate 41 and the counterweight 61 is disposed as close to the base plate 41 as possible so that the centroid A of the counterweight 61 is closer to the base plate 41, and the dimension of the whole machine in the up and down direction can be reduced while the torque is reduced, thereby making the structure of the whole machine more compact and reducing the weight of the whole machine.

[0042] The counterweight 61 is at least partially disposed in the support base 43, and the support base 43 is formed with a bypass groove 431 and an accommodation groove 432. The bypass groove 431 is located on the outer side of the accommodation groove 432 in a radial direction perpendicular to the motor axis 101, and an end surface of the support base 43 facing the upper surface 411 of the base plate 41 is recessed upward to form the bypass groove 431 and the accommodation groove 432. The accommodation groove 432 is used for accommodating the support 42, where a wall surface of the accommodation groove 432 is at least partially in contact with the outer race of the support 42. The bypass groove 431 partially overlaps with the support 42 in the axial direction. The bypass groove 431 is used for the counterweight 61 to move, where the radius E of the bypass groove 431 is greater than or equal to 20 mm. In this manner, the structure of the whole machine can be more compact in the up and down direction while it is ensured that the counterweight 61 has enough space for movement, thereby providing the user with a compact and lightweight sander 100.

[0043] The eccentric element 50 is fixedly connected to or integrally formed with the fan 31. In this example, the eccentric element 50 is integrally formed with the fan 31, that is, the fan 31 is formed with the eccentric element 50. The fan 31 is mounted on the motor shaft 211 and can be driven by the motor shaft 211 to rotate. Of course, in other words, the fan 31 is the eccentric element 50.

[0044] The ratio of the weight of the fan 31 to the weight of the electric motor 21 is greater than or equal to 3% and less than or equal to 25%. In the case where the weight of the electric motor 21 is constant, the smaller ratio of the weight of the fan 31 to the weight of the electric motor 21 means that the fan 31 is lighter and a smaller moment of inertia is generated when the fan 31 rotates, thereby greatly improving the feeling of operation of the user. On the other hand, when the fan 31 is lighter, the

entire sander 100 is lighter so that the sander 100 is convenient for the user to hold.

[0045] In this example, the fan 31 is made of a material with a density less than 6.5 g/cm^3 . Since the weight is proportional to the density, that is, the smaller the density, the smaller the weight of the fan 31. That is, the weight of the fan 31 is effectively reduced, thereby reducing the weight of the sander 100. For example, when the fan 31 is made of a material with a density greater than or equal to 1 g/cm^3 and less than or equal to 3 g/cm^3 , the weight of the fan 31 can be reduced while structural strength is satisfied. The fan 31 may be made of aluminum so that costs are saved while the weight of the fan 31 is reduced. When the sander 100 is placed as shown in FIG. 1 and the electric motor 21 drives the fan 31 to rotate, the fan 31 generates a moment of inertia, that is to say, when the fan 31 is rotated, a force of constraint is formed to keep the fan 31 rotating about the motor axis 101 (that is, the up and down direction). The force of constraint restricts the sander 100 to rotating around the up and down direction when the sander 100 has a tendency to move in a certain direction obliquely intersecting with the up and down direction. That is to say, when the user applies a force to the sander 100 to move the sander 100 in a certain direction obliquely intersecting with the up and down direction, the force of constraint causes the sander 100 to have a tendency to move in a direction opposite to the movement direction of the sander 100. Thus, the user is required to apply a greater force to overcome the force of constraint, causing inconvenience of operation. The user operating in such a manner for a long time easily feels fatigued, affecting working efficiency. The moment of inertia is proportional to the weight. The greater the weight of the fan 31, the greater the moment of inertia and the greater the effect on the user. Therefore, through the preceding arrangement, the moment of inertia can be reduced, thereby improving user experience.

[0046] The product of the weight of the fan 31 and the square of the outer diameter of the fan 31 is greater than or equal to 40 kg/cm^2 and less than or equal to 200 kg/cm^2 . The outer diameter refers to the diameter of the outer edge of the fan 31. The product of the weight of the fan 31 and the square of the outer diameter of the fan 31 is set within the preceding range so that the moment of inertia generated when the fan 31 rotates can be effectively reduced, the effect of the force of constraint during the operation of the user is reduced, and thus the working efficiency is improved.

[0047] The total weight of the fan 31 and the electric motor 21 is less than or equal to 400 g. In the internal structure of the sander 100, the electric motor 21 and the fan 31 are much heavier than other components, that is to say, the electric motor 21 and the fan 31 mainly contribute to the weight of the sander 100. The structures and positions of the balancing assembly 60 and the fan assembly 30 are configured so that the weight of the fan 31 is greatly reduced, thereby obtaining the sander 100 with a relatively small moment of inertia and a relatively

small weight. In this example, the weight of the fan 31 is less than or equal to 80 g.

[0048] As shown in FIG. 1, an air inlet, an air outlet, and a dust outlet are formed on the housing 10. The fan 31 is fixedly connected to the motor shaft 211, that is, the fan 31 operates as the electric motor 21 rotates. When the fan 31 rotates, the airflow enters from the air inlet, flows through the electric motor 21 and other components, and finally flows out from the air outlet, so as to achieve the effect of heat dissipation on the electric motor 21 and other components in the housing 10. On the other hand, the airflow can effectively blow dust on the base plate 41 to the dust outlet, and the dust finally enters a dust collection box (not shown in the figure), thereby achieving a dust collection effect.

[0049] As shown in FIGS. 6 and 7, the fan 31 includes a bracket 311, air guide portions 312, and dust suction portions 313. The bracket 311 has a substantially annular structure and includes an upper surface 321 and a lower surface 331 opposite to each other and a through hole 341. The upper surface 321 is disposed on a side of the bracket 311 facing away from the base plate 41 relative to the lower surface 331. The bracket 311 is fixedly connected to the motor shaft 211, that is, the through hole 341 of the bracket 311 is sleeved on an outer race of the motor shaft 211. Of course, an intermediate piece may be further provided between the through hole 341 of the bracket 311 and the outer race of the motor shaft 211, and the specific connection manner between the through hole 341 of the bracket 311 and the outer race of the motor shaft 211 is not limited as long as the synchronous rotation can be achieved. The fan 31 includes at least two air guide portions 312, the air guide portions 312 are distributed on the upper surface 321 of the bracket 311, and the air guide portions 312 are integrally formed with the bracket 311. Of course, the air guide portions 312 and the bracket 311 may be formed separately. The bracket 311 is annular, that is, the bracket 311 is basically symmetrical about the motor axis 101, the air guide portions 312 are evenly distributed on the upper surface 321 of the bracket 311 along a circumferential direction of the motor axis 101, and the air guide portions 312 extend upward along the direction of the motor axis 101. In this example, the air guide portions 312 are specifically arc-shaped heat dissipation blades, where the number of heat dissipation blades on the fan 31 is greater than or equal to 20 so that when the fan 31 rotates, a greater amount of air is generated and the fan 31 has a better heat dissipation effect. The arc length of each heat dissipation blade is greater than 13 mm so that when the fan 31 rotates, the greater amount of air is generated and the fan 31 has the better heat dissipation effect. The fan 31 includes at least two dust suction portions 313, and the dust suction portions 313 are distributed on the lower surface 331 of the bracket 311, that is, the dust suction portions 313 and the air guide portions 312 are disposed on two opposite sides of the bracket 311, where the dust suction portions 313 are adjacent to the base plate 41.

The dust suction portions 313 are integrally formed with the bracket 311. Of course, the dust suction portions 313 and the bracket 311 may be formed separately. The dust suction portions 313 are evenly distributed on the lower surface 331 of the bracket 311 along the circumferential direction of the motor axis 101, and the dust suction portions 313 extend downward along the direction of the motor axis 101. In this example, the dust suction portions 313 are specifically arc-shaped dust suction blades.

Claims

1. A sander, comprising:

a housing;
an electric motor at least partially disposed in the housing and used for providing a power source, wherein the electric motor comprises a motor shaft that rotates about a motor axis;
a fan assembly comprising a fan connected to the electric motor;
an eccentric element driven by the electric motor, wherein the eccentric element has a central axis separated from the motor axis; and
a base plate assembly comprising a base plate and a support for supporting the eccentric element, wherein the support comprises a first end surface and a second end surface opposite to each other, and the second end surface is closer to a lower surface than the first end surface;
wherein the sander further comprises a counterweight connected to the eccentric element and driven by the electric motor to rotate about the central axis; and
a ratio of a distance from a centroid of the counterweight to the lower surface of the base plate to a distance from the first end surface of the support to the lower surface of the base plate is greater than or equal to 0.2 and less than or equal to 0.4.

2. The sander of claim 1, wherein the counterweight comprises a body connected to the eccentric element; and

a centroid adjustment portion for adjusting the centroid of the counterweight;
wherein the centroid adjustment portion is fixedly connected to or integrally formed with the body.

3. The sander of claim 2, wherein the base plate assembly further comprises a support base for mounting the support, wherein the support base is fixedly connected to the base plate and comprises a bypass groove allowing the counterweight to rotate.

4. The sander of claim 2, wherein the base plate comprises a groove allowing the counterweight to move, and the counterweight at least partially overlaps with the base plate in an axial direction. 5
5. The sander of claim 4, wherein the groove is a circular groove, a center of the groove is located on the central axis, and a ratio of an inner diameter of the groove to an outer diameter of the base plate is greater than or equal to 0.25 and less than or equal to 0.4. 10
6. The sander of claim 1, wherein the counterweight comprises a weight increasing portion and a weight reducing portion, wherein the weight reducing portion is disposed on a side of the counterweight facing the base plate, and the weight increasing portion is disposed on a side of the counterweight facing the fan. 15
7. The sander of claim 1, wherein the counterweight comprises a weight increasing portion and a weight reducing portion, wherein the weight reducing portion is disposed on a side of the counterweight facing the fan, and the weight increasing portion is disposed on a side of the counterweight facing the base plate. 20 25
8. The sander of claim 4, wherein a product of a weight of the fan and a square of an outer diameter of the fan is greater than or equal to 40 kg/cm² and less than or equal to 200 kg/cm². 30
9. The sander of claim 1, wherein a ratio of a weight of the fan to a mass of the electric motor is greater than or equal to 3% and less than or equal to 25%. 35
10. A sander, comprising:
 - a housing;
 - an electric motor at least partially disposed in the housing and used for providing a power source, wherein the electric motor comprises a motor shaft that rotates about a motor axis;
 - a fan assembly comprising a fan connected to the electric motor;
 - an eccentric element driven by the electric motor, wherein the eccentric element has a central axis deviating from the motor axis; and
 - a base plate assembly comprising a base plate, a sanding member fixed to a lower surface of the base plate, and a support for supporting the eccentric element, wherein the support comprises a first end surface and a second end surface opposite to each other, and the second end surface is disposed on a side of the support facing the lower surface relative to the first end surface; 50
 - wherein the sander further comprises a counterweight connected to the eccentric element and driven by the electric motor to rotate about the central axis; and
 - a ratio of a distance from a centroid of the counterweight to the lower surface of the base plate to a distance from the first end surface of the support to the lower surface of the base plate is greater than or equal to 0.2 and less than or equal to 0.4, and a product of a weight of the fan and a square of an outer diameter of the fan is greater than or equal to 40 kg/cm² and less than or equal to 200 kg/cm².
11. The sander of claim 10, wherein the fan is located on an upper side of the counterweight along a direction of the motor axis, wherein a density of the fan is less than 6.5 g/cm³.
12. The sander of claim 10, wherein the base plate comprises a groove allowing the counterweight to move, and the counterweight at least partially overlaps with the base plate in an axial direction.
13. The sander of claim 12, wherein the groove is a circular groove, a center of the groove is located on the central axis, and a ratio of an inner diameter of the groove to an outer diameter of the base plate is greater than or equal to 0.25 and less than or equal to 0.4.
14. The sander of claim 10, wherein a ratio of the weight of the fan to mass of the electric motor is greater than or equal to 3% and less than or equal to 25%.
15. The sander of claim 10, wherein the counterweight comprises a weight increasing portion and a weight reducing portion, wherein the weight reducing portion is disposed on a side of the counterweight facing the base plate, and the weight increasing portion is disposed on a side of the counterweight facing the fan.
16. The sander of claim 10, wherein the counterweight comprises a weight increasing portion and a weight reducing portion, wherein the weight reducing portion is disposed on a side of the counterweight facing the fan, and the weight increasing portion is disposed on a side of the counterweight facing the base plate. 55

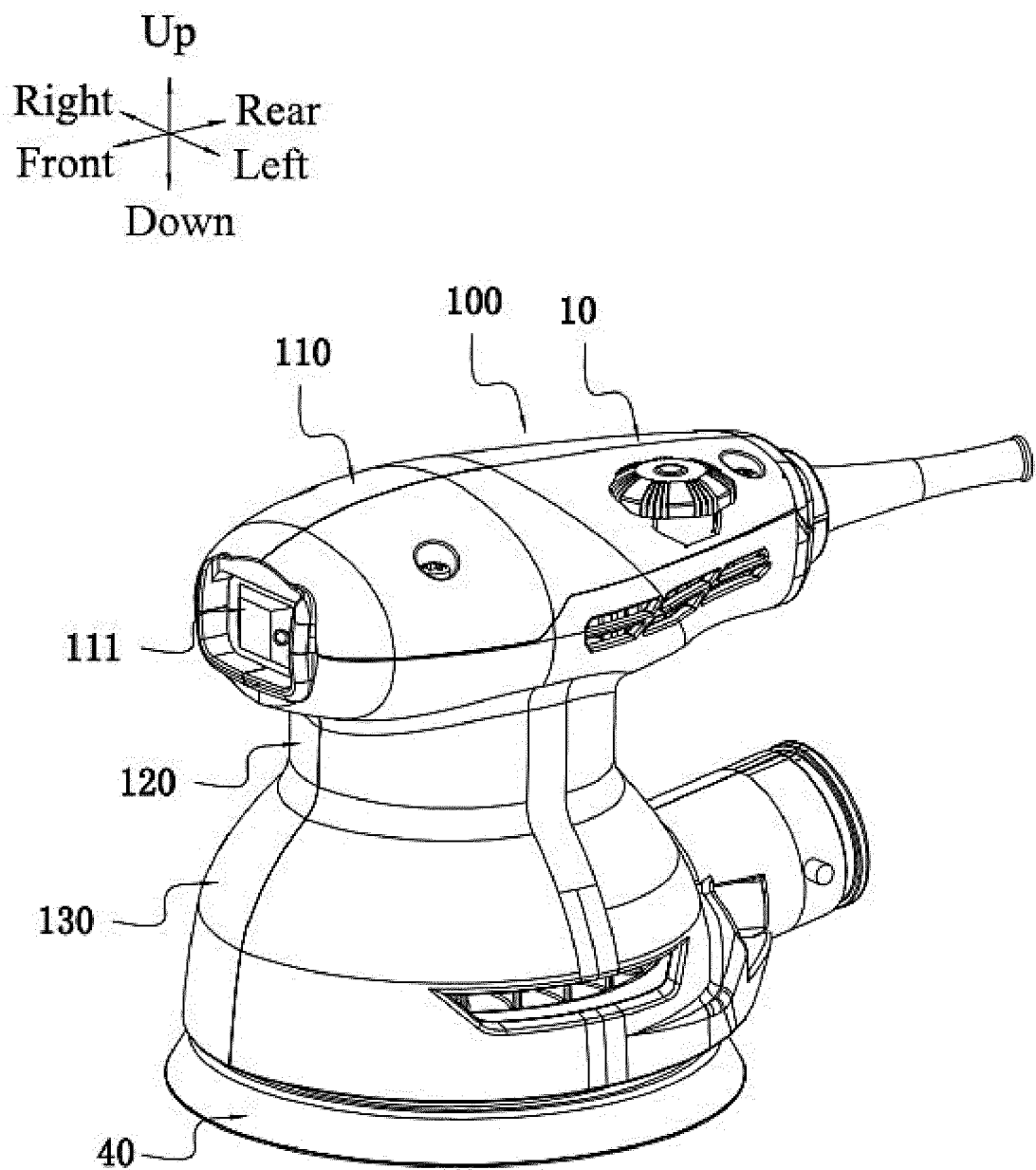


Fig. 1

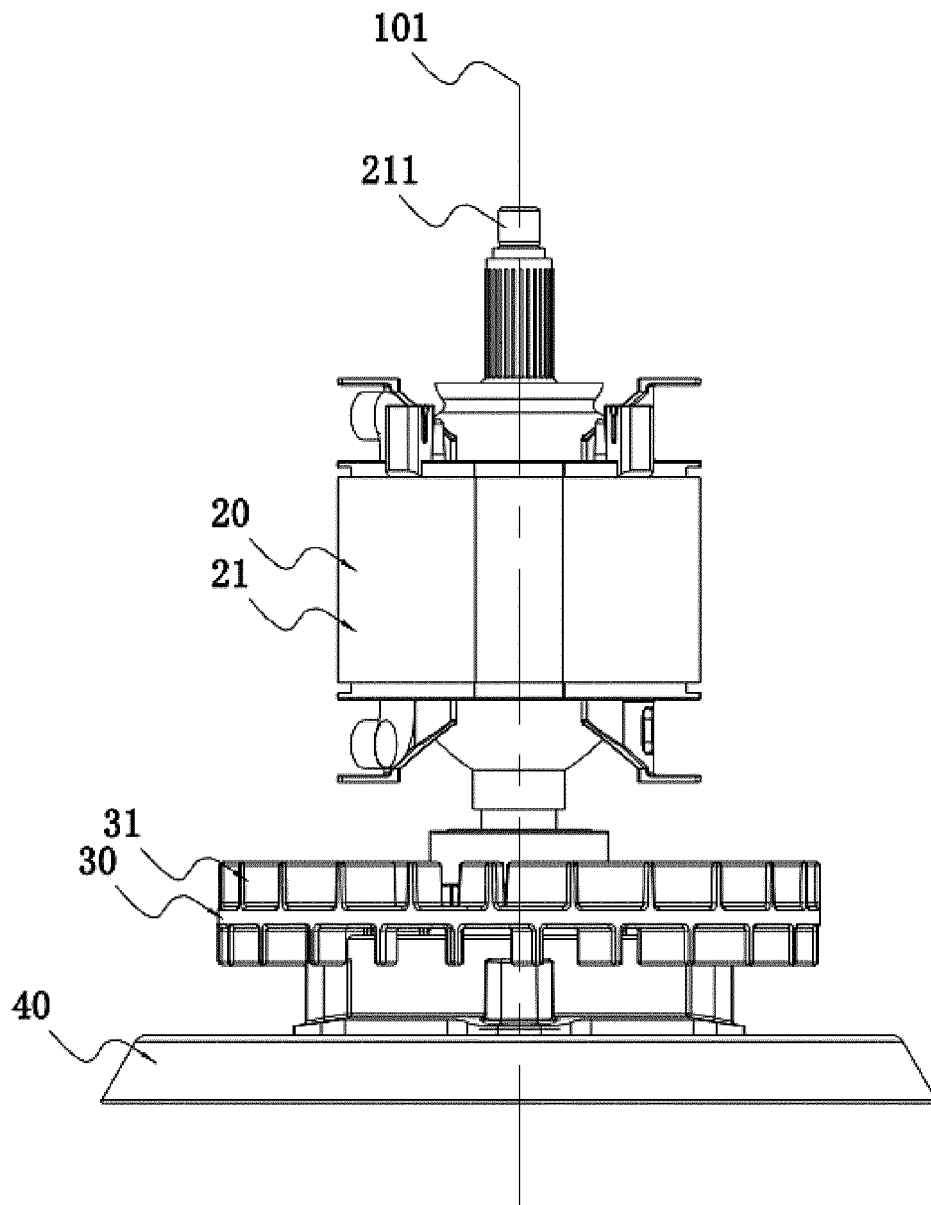


Fig. 2

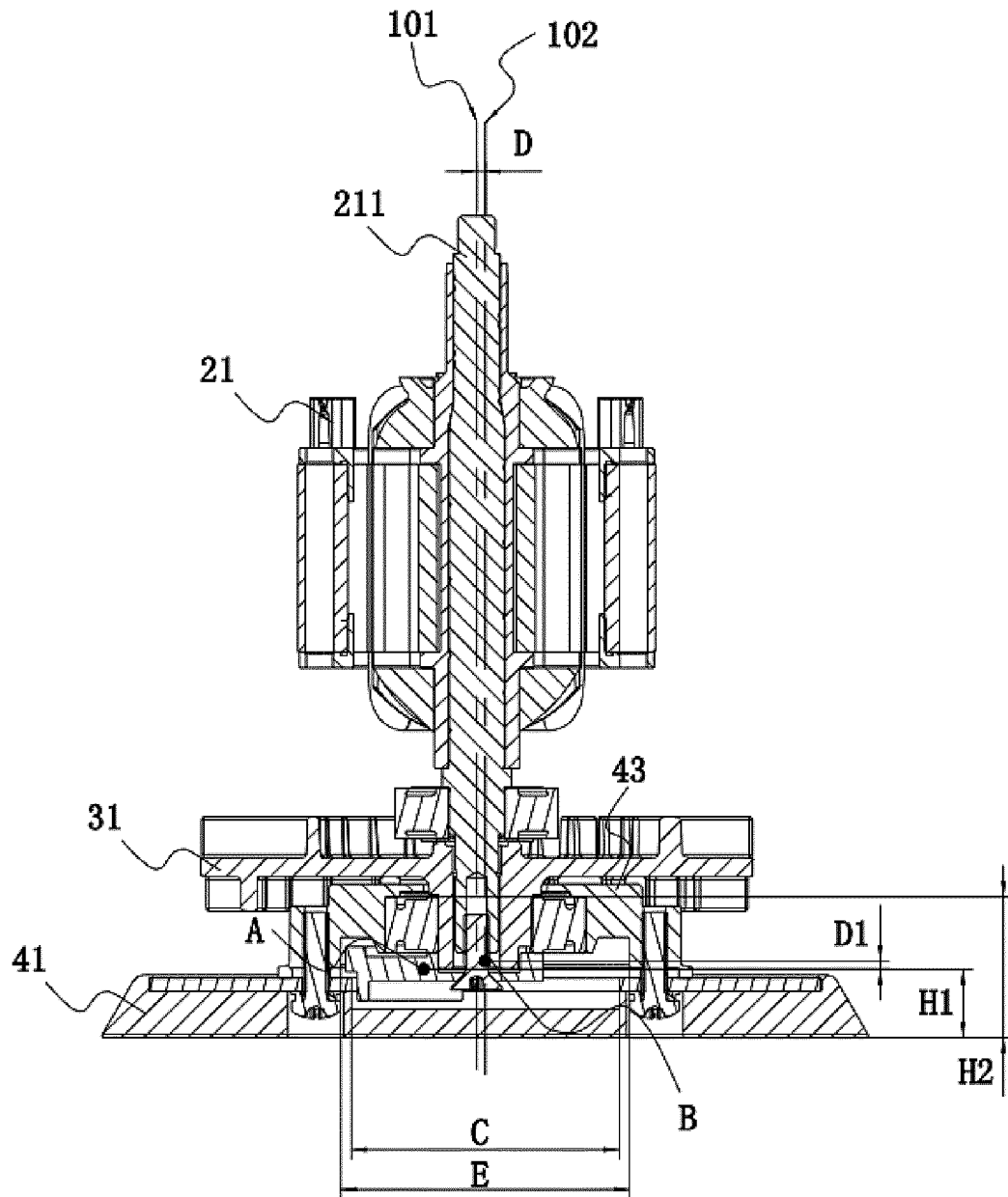


Fig. 3

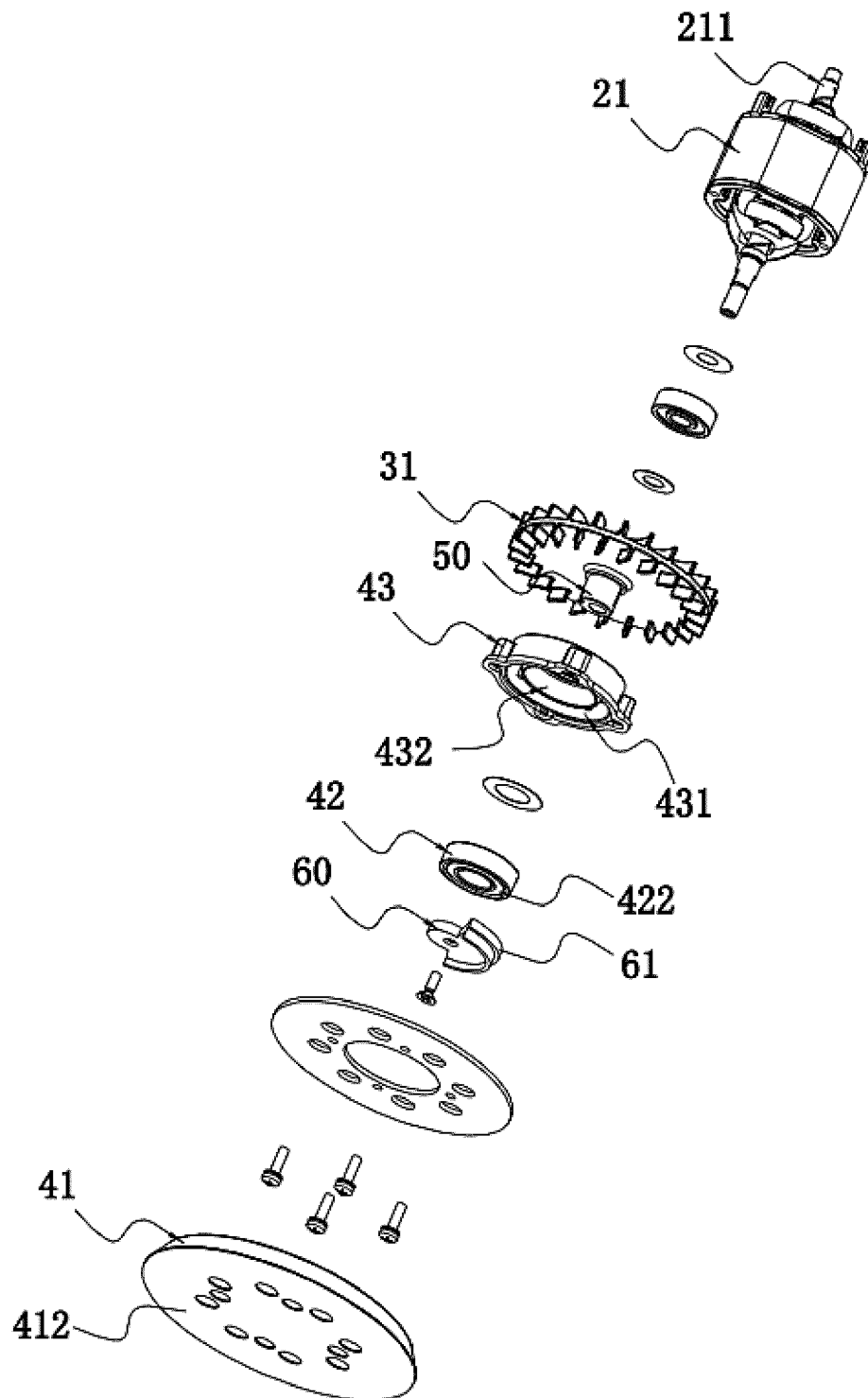


Fig. 4

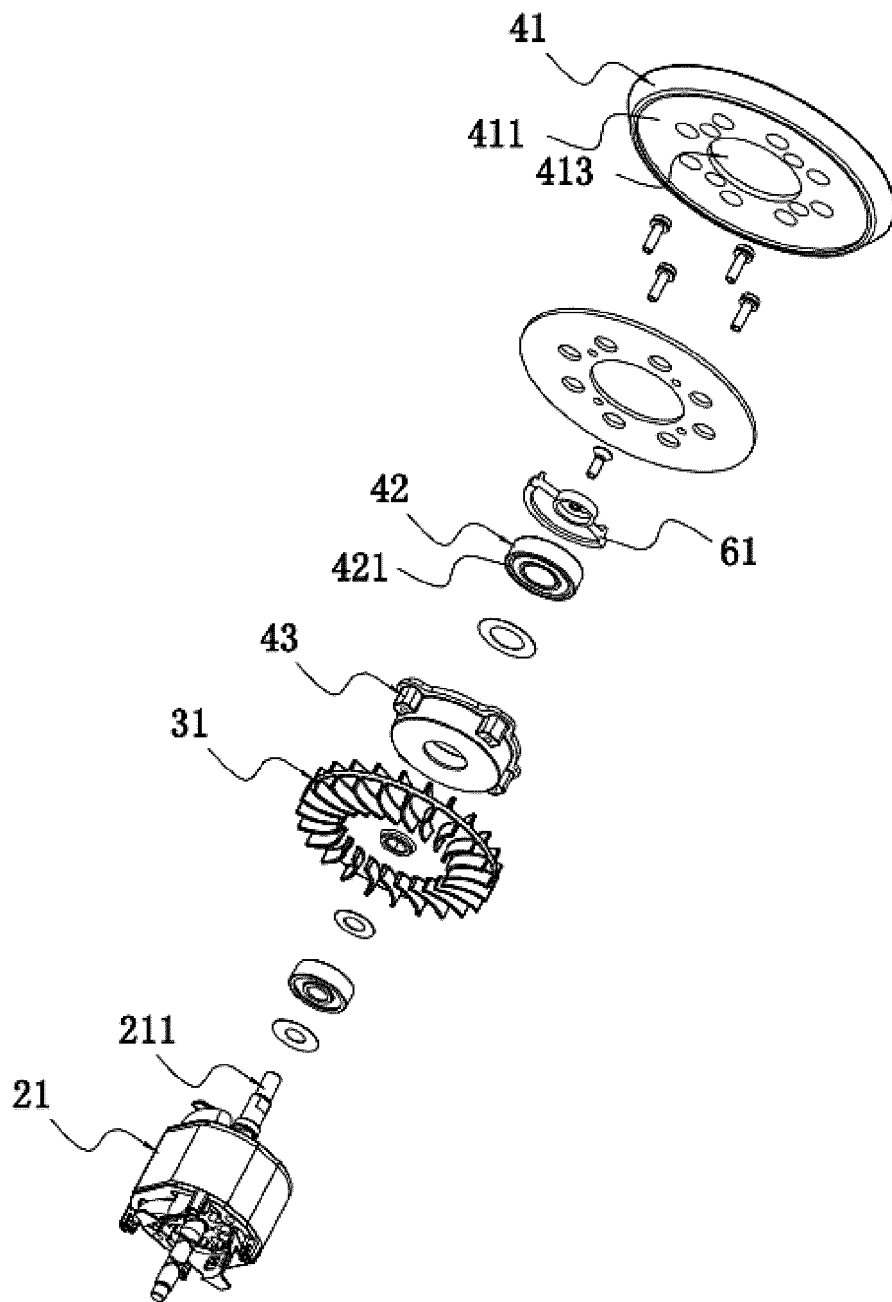


Fig. 5

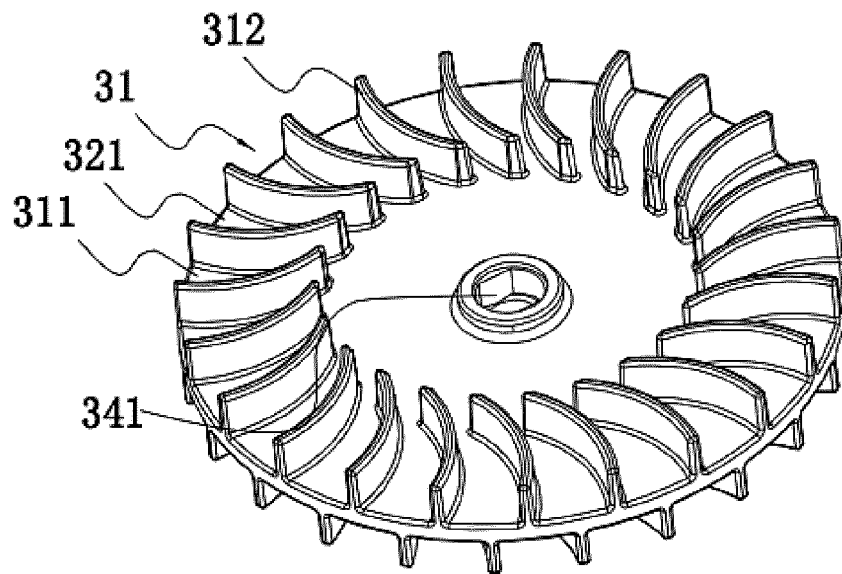


Fig. 6

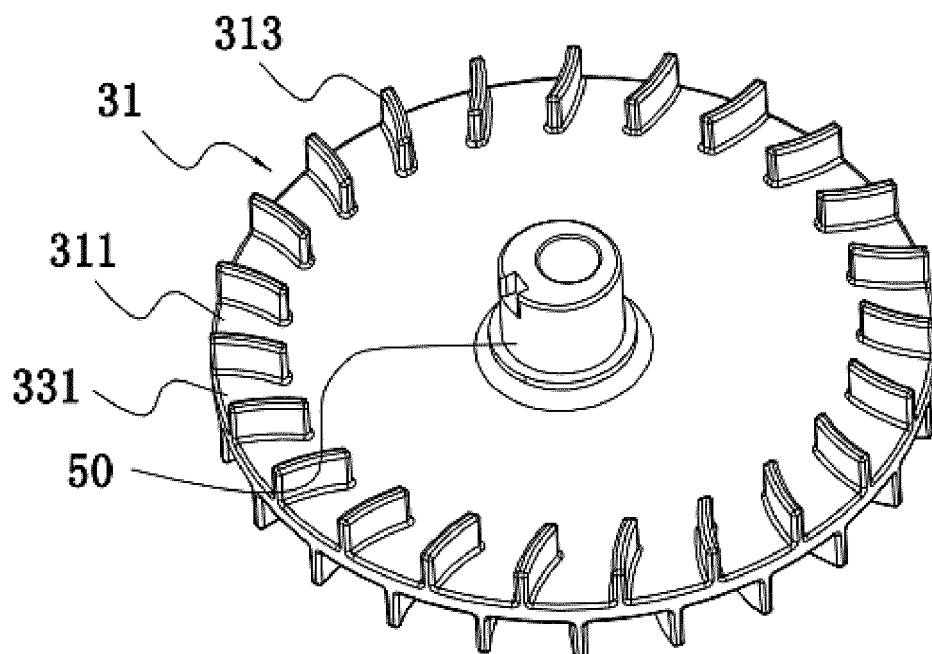


Fig. 7

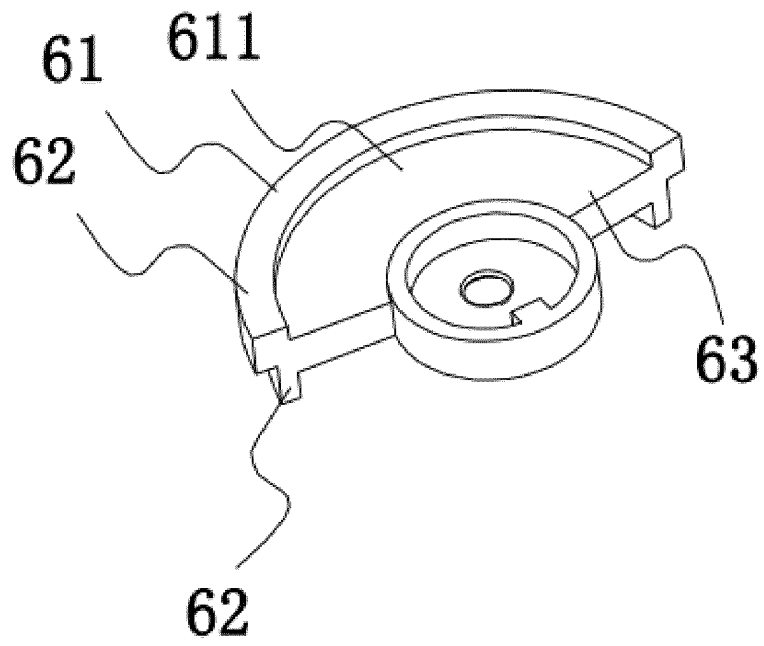


Fig. 8

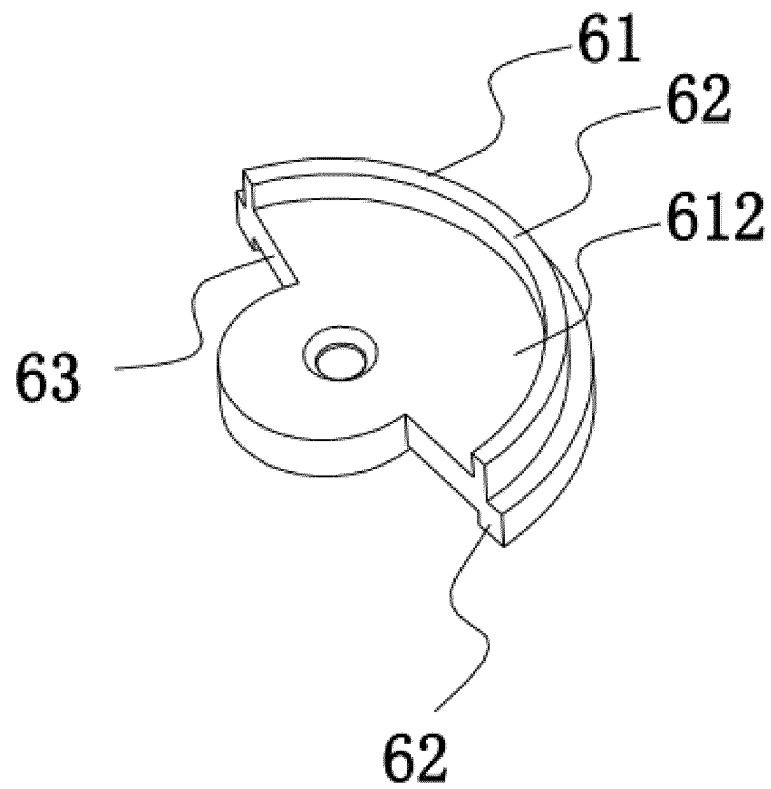


Fig. 9

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2021/130880

A. CLASSIFICATION OF SUBJECT MATTER

B24B 23/02(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

B24B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CNABS; WPABS; DWPI; CJFD: 平衡, 配重, 质心, 重心, 砂光机, 打磨机, 偏心, 风扇, 外径, 直径, 重量, 质量, 扭矩, 转动惯量; mass, off-center, barycenter, fan, partiality, balance, bias, center, weight, centre, gravity, counterweight, balancing, centroid, barycentre, couter, eccentric, fan, daimeter, diametre, sander, finishi+, abrasiv+, torsion, torque, inertia

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 211940308 U (JIANGSU JINDING ELECTRIC APPLIANCE CO., LTD.) 17 November 2020 (2020-11-17) entire document	1-16
A	CN 208231559 U (ZHANG, Yong) 14 December 2018 (2018-12-14) entire document	1-16
A	CN 207841048 U (POSITEC POWER TOOLS (SUZHOU) CO., LTD.) 11 September 2018 (2018-09-11) entire document	1-16
A	CN 211916459 U (XU, Ziyang) 13 November 2020 (2020-11-13) entire document	1-16
A	EP 2127808 A1 (BLACK & DECKER INC.) 02 December 2009 (2009-12-02) entire document	1-16
A	JP 62297066 A (ROBERT BOSCH GMBH) 24 December 1987 (1987-12-24) entire document	1-16



Further documents are listed in the continuation of Box C.



See patent family annex.

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“O” document referring to an oral disclosure, use, exhibition or other means

“P” document published prior to the international filing date but later than the priority date claimed

“T” later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

“X” document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

“Y” document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

“&” document member of the same patent family

Date of the actual completion of the international search

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Date of mailing of the international search report

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Name and mailing address of the ISA/CN

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Facsimile No. (86-10)62019451

Authorized officer

Telephone No.

Form PCT/ISA/210 (second sheet) (January 2015)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/CN2021/130880

Patent document cited in search report			Publication date (day/month/year)		Patent family member(s)			Publication date (day/month/year)	
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CN	208231559	U	14 December 2018		None				
CN	207841048	U	11 September 2018		None				
CN	211916459	U	13 November 2020		None				
EP	2127808	A1	02 December 2009		None				
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					IT	1204704	B	10 March 1989	
					GB	8711493	D0	17 June 1987	
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					DE	3620136	C2	09 September 1993	
					DE	3620136	C5	11 January 2007	
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					JP	2831351	B2	02 December 1998	

REFERENCES CITED IN THE DESCRIPTION

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