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(54) **BELT TYPE GRINDING TOOL**

(57) [Technical Problem] Provided is a belt-type grinding tool configured to be capable of cooling an end-less grinding belt even more efficiently.

[Solution to Problem] The belt-type grinding tool 10 includes a fan 36 disposed inside an outer peripheral portion 28 of a drive pulley 22. The belt-type grinding tool 10 has airflow paths 68 formed therein which extend from inner opening portions 62 of a cover 52 to pass through inside the outer peripheral portion 28 and through through-holes 46 in the drive pulley 22 and which turn around a side end edge 28b of the outer peripheral portion 28 to pass through outside the outer peripheral portion 28 to reach outer opening portions 64 of the cover 52. When the fan 36 is rotated, together with the drive pulley 22, the outside air is sucked into an accommodating space 58 from the inner opening portions 62. The air flows along the airflow paths 68 and is discharged to the outside of the accommodating space 58 from the outer opening portions 64. The drive pulley 22 and the endless grinding belt 24 are efficiently cooled by the air.

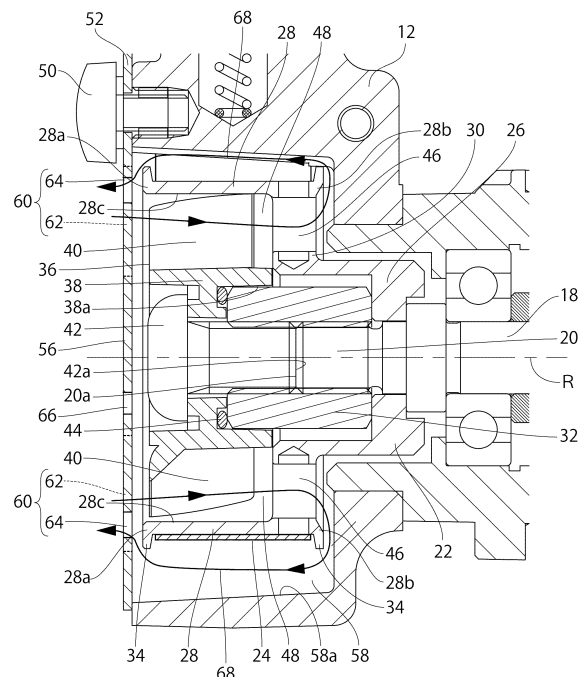


FIG. 3

Description

Technical Field:

[0001] The present invention relates to belt-type grinding tools. More particularly, the present invention relates to a belt-type grinding tool having a function of cooling an endless grinding belt.

Background Art:

[0002] A belt-type grinding tool includes an idle pulley attached rotatably, a drive pulley to be rotationally driven by a motor, and an endless grinding belt wound between the idle pulley and the drive pulley. The endless grinding belt, which is rotationally driven in response to the rotation of the drive pulley, is pressed against a material to be ground, thereby grinding the material (Patent Literature 1). With such a belt-type grinding tool, the endless grinding belt is heated by friction between itself and the material during the grinding operation.

[0003] As the endless grinding belt is heated, the drive pulley, the motor shaft, etc. also heat up, and particularly, bearings rotatably supporting these components may be degraded by heat. To solve such a problem, a belt sander disclosed in Patent Literature 2, for example, has a fan provided on a driving roller. The fan is rotated, together with the driving roller, thereby sucking the outside air into the interior of the tool. The sucked air passes through inside the driving roller and is led into a dust bag by a dust collecting fan. Thus, the air flows around the shaft of the driving roller and the bearings rotatably supporting the roller shaft, and these members are cooled by the flow of air.

Citation List:

Patent Literature:

[0004]

Patent Literature 1: Japanese Patent Application Publication No. 2014-166668 (JP 2014-166668 A)
Patent Literature 2: Japanese Examined Utility Model Application Publication

Summary of Invention:

Technical Problem:

[0005] Another problem encountered when the endless grinding belt is heated is the rupture of the endless grinding belt. The endless grinding belt is usually formed by bonding together the opposite ends of a belt-shaped material with an adhesive into an endless belt shape. In this regard, if the bonded portions heat up excessively, the adhesive may melt, which may result in rupture of the belt. In the above-described conventional belt sander,

the endless grinding belt is cooled indirectly to a certain extent by cooling the driving roller. The belt sander, however, is configured to cool mainly the shaft of the driving roller and the bearings and is therefore unsatisfactory in terms of the cooling effect on the endless grinding belt.

[0006] Accordingly, an object of the present invention is to provide a belt-type grinding tool configured to be capable of efficiently cooling an endless grinding belt wound between an idle pulley and a drive pulley.

Solution to Problem:

[0007] The present invention provides a belt-type grinding tool including the following elements: a tool body including a motor; an idle pulley rotatably attached to the tool body; a drive pulley to be rotatably driven by the motor and having a cylindrical outer peripheral portion configured to support an endless grinding belt wound between the drive pulley and the idle pulley; a fan at least partially disposed radially inside the outer peripheral portion, the fan being configured to rotate together with the drive pulley to generate a flow of air passing through inside the outer peripheral portion in the direction of a rotation axis of the drive pulley; a cover having a cover plate portion disposed adjacent to one side end edge of the outer peripheral portion in the direction of the rotation axis, the cover defining between itself and the tool body an accommodating space accommodating the drive pulley, the cover plate portion having an inner opening portion and an outer opening portion, the inner opening portion opening into the accommodating space at a position radially inward of an inner peripheral surface of the outer peripheral portion, and the outer opening portion opening into the accommodating space at a position radially outward of the inner peripheral surface of the outer peripheral portion; and an airflow path provided in the accommodating space, the airflow path extending from the inner opening portion to pass through inside the outer peripheral portion and turning around the other side end edge of the outer peripheral portion to pass through outside the outer peripheral portion to reach the outer opening portion. When the fan is rotated, the outside air is sucked into the accommodating space from one of the inner opening portion and the outer opening portion to flow along the airflow path and discharged to the outside of the accommodating space from the other of the inner opening portion and the outer opening portion.

[0008] The belt-type grinding tool of the present invention is configured such that the air sucked into the accommodating space by the fan passes not only through inside the outer peripheral portion of the drive pulley but also through outside the outer peripheral portion. Accordingly, not only the drive pulley but also the endless grinding belt, which is supported on the outer peripheral surface of the outer peripheral portion, is directly cooled. Thus, the endless grinding belt can be cooled even more efficiently, and it is possible to prevent the rupture of the belt due to heat.

[0009] Specifically, the arrangement may be as follows. The cover plate portion has a slot extending from a position radially inward of the inner peripheral surface of the outer peripheral portion to a position radially outward of the inner peripheral surface of the outer peripheral portion. The inner opening portion and the outer opening portion are each formed as a part of the slot.

[0010] Preferably, the slot may be curved with respect to a radial direction about the rotation axis. With this arrangement, the opening area can be increased in comparison with a rectilinear hole, and the air can be sucked into the accommodating space even more efficiently.

[0011] Preferably, the slot may have a size such that a human finger cannot enter the slot. Thus, it is possible to prevent a human finger from accidentally touching the rotating drive pulley or endless grinding belt, which would otherwise cause an injury. It should be noted that the term "a size such that a human finger cannot enter the slot" means a size such that a test finger selected in conformity with the use environment cannot reach into the accommodating space.

[0012] Specifically, the arrangement may be as follows. The drive pulley further includes a center secured portion connected to a rotating shaft drivably connected to the motor, and a connecting portion extending from the outer peripheral portion to the center secured portion. The connecting portion has a through-hole extending therethrough in the direction of the rotation axis. The air-flow path is configured to pass through the through-hole.

[0013] More specifically, the arrangement may be as follows. When the fan is rotated, the outside air is sucked into the accommodating space from the inner opening portion to flow along the airflow path such that the air passes through inside the outer peripheral portion, passes through the through-hole, turns around the other side end edge of the outer peripheral portion, passes through outside the outer peripheral portion, and is discharged to the outside of the accommodating space from the outer opening portion.

[0014] Preferably, the arrangement may be as follows. The fan has a plurality of blades arranged at a first space in a circumferential direction of the outer peripheral portion, and the through-hole includes a plurality of the through-holes arranged in the circumferential direction at a second space. The first space and the second space are different from one another.

[0015] More preferably, a gap in the direction of the rotation axis may be formed between the fan and the connecting portion of the drive pulley. This makes it possible to prevent the through-hole from being closed by the fan.

[0016] In addition, the present invention provides a belt-type grinding tool including the following elements: a tool body including a motor; an idle pulley rotatably attached to the tool body; a drive pulley to be rotatably driven by the motor and having a cylindrical outer peripheral portion configured to support an endless grinding belt wound between the drive pulley and the idle pulley;

a fan at least partially disposed radially inside the outer peripheral portion, the fan being configured to rotate together with the drive pulley to generate a flow of air passing through inside the outer peripheral portion in the direction of a rotation axis of the drive pulley; and a cover having a cover plate portion disposed adjacent to one side end edge of the outer peripheral portion in the direction of the rotation axis, the cover defining between itself and the tool body an accommodating space accommodating the drive pulley, the cover plate portion having a slot extending from an inner opening portion to an outer opening portion, the inner opening portion opening into the accommodating space at a position radially inward of an inner peripheral surface of the outer peripheral portion, the outer opening portion opening into the accommodating space at a position radially outward of the inner peripheral surface of the outer peripheral portion. When the fan is rotated, the outside air is sucked into the accommodating space from the slot to pass through inside the outer peripheral portion and discharged to the outside of the accommodating space.

[0017] According to the above-described belt-type grinding tool, the slot provided in the cover extends from the inside to outside of the outer peripheral portion of the drive pulley. Therefore, when the outside air is sucked into the accommodating space by the fan, the air is blown over the outer peripheral portion at the side end edge. In addition, the opening area of the slot is increased, so that a larger amount of air can be sucked in. For these reasons, the drive pulley can be cooled efficiently.

[0018] Embodiments of a belt-type grinding tool according to the present invention will be explained below on the basis of the accompanying drawings.

Brief Description of Drawings:

[0019]

Fig. 1 is a side view of a belt-type grinding tool according to an embodiment of the present invention. Fig. 2 is a side view of the belt-type grinding tool in Fig. 1, with a cover removed therefrom.

Fig. 3 is a fragmentary sectional view taken along the line A-A in Fig. 1.

Fig. 4 is an illustration showing a second embodiment of the cover.

Fig. 5 is an illustration showing a third embodiment of the cover.

Fig. 6 is an illustration showing a fourth embodiment of the cover.

Fig. 7 is an illustration showing a fifth embodiment of the cover.

Description of Embodiments:

[0020] A belt-type grinding tool 10 according to an embodiment of the present invention includes, as shown in Figs. 1 to 3, a tool body 12 extending in the direction of

a longitudinal axis L, an idle pulley 16 rotatably attached to a distal end portion 14 of the tool body 12, and a drive pulley 22 secured to a rotating shaft 20. The rotating shaft 20 is drivably connected to an electric motor 18 of the tool body 12. An endless grinding belt 24 is wound between the idle pulley 16 and the drive pulley 22. The drive pulley 22 is driven to rotate counterclockwise as seen in Fig. 2 by the electric motor 18. In response to the rotation of the drive pulley 22, the endless grinding belt 24 is also rotated in the same direction. The tool body 12 has a shoe 25 attached thereto so as to extend along an inner peripheral surface 24a of the endless grinding belt 24. The rotating endless grinding belt 24 is pressed against a material to be ground at a position thereof supported by the shoe 25 from the inside, thereby performing a grinding operation for the material to be ground.

[0021] The drive pulley 22 has, as shown in Fig. 3, a cylindrical center secured portion 26 secured to the rotating shaft 20, a cylindrical outer peripheral portion 28 supporting the endless grinding belt 24, and a connecting portion 30 extending in a radial direction about a rotation axis R of the drive pulley 22 to connect the center secured portion 26 and the outer peripheral portion 28 to each other. The drive pulley 22 is secured to the rotating shaft 20 by a hexagon nut 32 threadedly engaged with the rotating shaft 20. The outer peripheral portion 28 has side end edges 28a and 28b at opposite sides thereof in the direction of the rotation axis R. The side end edges 28a and 28b have flange portions 34, respectively, for preventing the endless grinding belt 24 from coming off.

[0022] A fan 36 is provided radially inside the outer peripheral portion 28. The fan 36 has a center secured portion 38 and blades 40 extending radially outward from the center secured portion 38. As will be clear from Fig. 2, there are five blades 40 arranged at equal spaces in the circumferential direction. The fan 36 is secured to the hexagon nut 32 by a securing screw 42, with a part of the hexagon nut 32 received in the center secured portion 38. An inner peripheral surface 38a of the center secured portion 38, which receives the hexagon nut 32, has a hexagonal shape sized to the outer diameter of the hexagon nut 32 so that the fan 36 is surely secured to the hexagon nut 32 in the rotational direction. The securing screw 42 is secured in a state where an end face 42a thereof abuts against an end face 20a of the rotating shaft 20. Consequently, the hexagon nut 32 and the securing screw 42 cannot easily become loosened. An O-ring 44 is disposed between the fan 36 and the hexagon nut 32 so that the fan 36 is pressed against the head of the securing screw 42 to thereby suppress backlash of the fan 36. The fan 36 is wholly disposed inside the outer peripheral portion 28. However, the configuration may be varied such that a part of the fan 36 projects to the outside of the outer peripheral portion 28.

[0023] The connecting portion 30 of the drive pulley 22 has through-holes 46 formed to extend therethrough in the direction of the rotation axis R. There are eight through-holes 46 provided at equal spaces in the circum-

ferential direction. In Fig. 2, some of the through-holes 46 are hidden behind the blades 40 of the fan 36 and cannot be seen. By arranging the blades 40 of the fan 36 and the through-holes 46 at mutually different spaces in the circumferential direction, it is possible to avoid the fronts of all the through-holes 46 being blocked by the blades 40 no matter in which orientation the fan 36 is mounted relative to the drive pulley 22 in the rotational direction. In addition, a gap 48 in the direction of the rotation axis R is formed between the blades 40 of the fan 36 and the connecting portion 30 of the drive pulley 22 to avoid the through-holes 46 of the connecting portion 30 being closed by the blades 40 of the fan 36, thereby preventing interference with the flow of air (described later).

[0024] The tool body 12 further has a cover 52 attached thereto by a securing screw 50. The cover 52 has a secured portion 54 secured to the tool body 12 by the securing screw 50, and a cover plate portion 56 disposed adjacent to one side end edge 28a of the outer peripheral portion 28 in the direction of the rotation axis R. The cover 52 defines between itself and the tool body 12 an accommodating space 58 accommodating the drive pulley 22. The cover plate portion 56 has, as shown in Fig. 1, a plurality of slots 60 curved with respect to the radial direction about the rotation axis R. Each slot 60 extends from a position radially inward of the inner peripheral surface 28c of the outer peripheral portion 28 of the drive pulley 22 to a position radially outward of the inner peripheral surface 28c of the outer peripheral portion 28, and has an inner opening portion 62 opening into the accommodating space 58 at a position radially inward of the inner peripheral surface 28c of the outer peripheral portion 28, and an outer opening portion 64 opening into the accommodating space 58 at a position radially outward of the inner peripheral surface 28c of the outer peripheral portion 28. It should be noted that the slots 60 each have a size such that a human finger cannot reach into the accommodating space 58. Specifically, the slots 60 are designed to have a size such that a test finger selected in conformity with the use environment cannot reach into the accommodating space 58. The test finger used in the design of this embodiment was prepared in compliance with International Electrotechnical Commission Standards IEC60529. The cover plate portion 56 has an arrow-shaped hole 66 formed in the vicinity of the center thereof to indicate the rotational direction of the drive pulley 22.

[0025] With the above-described configuration, the belt-type grinding tool 10 has airflow paths 68 formed therein as shown by the arrows in Fig. 3. Each airflow path 68 extends from the inner opening portion 62 of the cover 52 to pass through inside the outer peripheral portion 28 of the drive pulley 22, and after passing through the through-hole 46 in the connecting portion 30, the airflow path 68 turns around the other side end edge 28b of the outer peripheral portion 28 to pass through outside the outer peripheral portion 28 to reach the outer opening

portion 64. The fan 36, which is disposed inside the drive pulley 22, is secured to the rotating shaft 20; therefore, when the drive pulley 22 is driven to rotate, the fan 36 rotates, together with the drive pulley 22, as has been described above. When the fan 36 rotates, a flow of air is generated which passes through inside the outer peripheral portion 28 of the drive pulley 22 in the direction of the rotation axis R. Consequently, the air flows along the airflow paths 68. Specifically, the outside air is sucked into the accommodating space 58 from the inner opening portions 62. The sucked air passes through inside the outer peripheral portion 28 of the drive pulley 22, where the fan 36 is disposed, and passes through the through-holes 46 to exit to the outside of the drive pulley 22. The air having passed through the through-holes 46 hits an inner peripheral surface 58a of the accommodating space 58 to change the direction thereof to radially outward and turns around the other side end edge 28b of the outer peripheral portion 28. The air further passes through outside the outer peripheral portion 28 and is discharged to the outside of the accommodating space 58 from the outer opening portions 64. A part of the air discharged from the outer opening portions 64 is sucked into the accommodating space 58 again from the inner opening portions 62 along the slots 60 or after once exiting to the outside of the cover 52. The accommodating space 58 is open at a forward portion 58b (upper portion as seen in Figs. 1 and 2) and at a lower portion 58c (left portion as seen in Figs. 1 and 2). Therefore, a part of the air sucked into the accommodating space 58 is also discharged to the outside of the accommodating space 58 from the forward portion 58b and the lower portion 58c after passing through the through-holes 46. Because the endless grinding belt 24 passes through the forward portion 58b and the lower portion 58c, a part of the air discharged from the forward portion 58b and the lower portion 58c is blown over the endless grinding belt 24.

[0026] Thus, in the belt-type grinding tool 10, the outside air sucked into the accommodating space 58 by the fan 36 passes through both inside and outside the outer peripheral portion 28 of the drive pulley 22; therefore, the drive pulley 22 can be cooled even more efficiently. Accordingly, the endless grinding belt 24 can be cooled even more efficiently through the drive pulley 22. In addition, the air flowing along the airflow paths 68 also hits the endless grinding belt 24 directly when passing through outside the outer peripheral portion 28; therefore, the endless grinding belt 24 can also be cooled directly. Consequently, it is possible to perform cooling of the endless grinding belt 24 more efficiently than in the conventional belt-type grinding tool 10, and hence possible to prevent the rupture of the endless grinding belt 24 due to heat.

[0027] In the above-described embodiment, the slots 60 extend from the inside to outside of the outer peripheral portion 28 of the drive pulley 22 and are located at the position of the one side end edge 28a of the outer peripheral portion 28. Therefore, when sucked through

the slots 60, the air is blown over the outer peripheral portion 28 at the side end edge 28a. This also makes it possible to cool the drive pulley 22 efficiently and hence possible to prevent the rupture of the endless grinding belt 24 due to heat even more surely. Further, a part of the air discharged from the forward portion 58b and lower portion 58c of the accommodating space 58 is blown over the endless grinding belt 24. This also enables cooling of the endless grinding belt 24.

[0028] The shape and layout of the inner opening portions 62 and the outer opening portions 64, which are provided in the cover 52, can be changed at will. For example, a cover 152 shown in Fig. 4 has inner opening portions 162 and outer opening portions 164 which are formed as independent holes, respectively. In this case, however, no air is blown over the outer peripheral portion 28 of the drive pulley 22. In a cover 252 shown in Fig. 5, slots 260 have a bent shape so that outer opening portions 264 have a larger area. In a cover 352 shown in Fig. 6, the curve direction of slots 360 is opposite to that in the cover 52 shown in Fig. 1. A cover 452 shown in Fig. 7 has rectilinear long slots 460-1 and short slots 460-2 arranged alternately in the circumferential direction. The shapes and layouts of the above-described slots and inner and outer opening portions are shown merely for exemplary purposes and may be changed to other configurations.

[0029] Although some embodiments of the present invention have been described above, the present invention is not limited to these embodiments. For example, although in the foregoing embodiments the outside air is sucked from the inner opening portions and discharged from the outer opening portions, the air may be made to flow reversely by reversing the rotational direction of the drive pulley or by reversing the direction of the blades of the fan. In other words, the arrangement may be as follows. The outside air is sucked into the accommodating space from the outer opening portions to pass through outside the outer peripheral portion of the drive pulley. The air turns around the other side end edge of the outer peripheral portion and passes through the through-holes in the connecting portion and through inside the outer peripheral portion and is discharged to the outside of the accommodating space from the inner opening portions. Further, it is desirable to include both the configuration in which the air sucked into the accommodating space is blown directly over the outer peripheral portion of the drive pulley and the configuration in which the air flows along the airflow path passing through inside and outside the outer peripheral portion. It is, however, not always necessary to include both the configurations, but the belt-type grinding tool may include only either of the configurations. Such an arrangement still makes it possible to obtain a cooling effect sufficiently superior to that of the conventional technique. Further, it is possible to change the number of blades of the fan and the number of through-holes in the connecting portion. Although the foregoing embodiments show an electric motor-driven

belt-type grinding tool including an electric motor, the present invention is also applicable to a pneumatic belt-type grinding tool employing an air motor in place of the electric motor.

List of Reference Signs:

[0030]

10: belt-type grinding tool
 12: tool body
 14: distal end portion
 16: idle pulley
 18: electric motor
 20: rotating shaft
 20a: end face
 22: drive pulley
 24: endless grinding belt
 24a: inner peripheral surface
 25: shoe
 26: center secured portion
 28: outer peripheral portion
 28a: side end edge
 28b: side end edge
 28c: inner peripheral surface
 30: connecting portion
 32: hexagon nut
 34: flange portions
 36: fan
 38: center secured portion
 38a: inner peripheral surface
 40: blades
 42: securing screw
 42a: end face
 44: O-ring
 46: through-holes
 48: gap
 50: securing screw
 52: cover
 54: secured portion
 56: cover plate portion
 58: accommodating space
 58a: inner peripheral surface
 58b: forward portion
 58c: lower portion
 60: slots
 62: inner opening portions
 64: outer opening portions
 66: arrow-shaped hole
 68: airflow paths
 152: cover
 162: inner opening portions
 164: outer opening portions
 252: cover
 260: slots
 264: outer opening portions
 352: cover
 360: slots

452: cover
 460-1: long slots
 460-2: short slots
 L: longitudinal axis
 R: rotation axis

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Claims

- 10 1. A belt-type grinding tool comprising:
- 15 a tool body including a motor;
 an idle pulley rotatably attached to the tool body;
 a drive pulley to be rotatably driven by the motor
 and having a cylindrical outer peripheral portion
 configured to support an endless grinding belt
 wound between the drive pulley and the idle pulley;
 20 a fan at least partially disposed radially inside
 the outer peripheral portion, the fan being configured
 to rotate together with the drive pulley to
 generate a flow of air passing through inside the
 outer peripheral portion in a direction of a rotation
 axis of the drive pulley;
 25 a cover having a cover plate portion disposed
 adjacent to one side end edge of the outer peripheral
 portion in the direction of the rotation axis, the cover
 defining between itself and the tool body an accommodating
 space accommodating the drive pulley, the cover plate
 portion having an inner opening portion and an outer
 opening portion, the inner opening portion opening
 into the accommodating space at a position radially
 inward of an inner peripheral surface of the outer
 peripheral portion, and the outer opening portion
 opening into the accommodating space at a position
 radially outward of the inner peripheral surface of the
 outer peripheral portion; and
 30 an airflow path provided in the accommodating
 space, the airflow path extending from the inner
 opening portion to pass through inside the outer
 peripheral portion and turning around an other side
 end edge of the outer peripheral portion to pass
 through outside the outer peripheral portion to reach
 the outer opening portion;
 35 wherein when the fan is rotated, outside air is
 sucked into the accommodating space from one of
 the inner opening portion and the outer opening
 portion to flow along the airflow path and
 discharged to an outside of the accommodating
 space from the other of the inner opening portion
 and the outer opening portion.
- 40
- 45
- 50
- 55 2. The belt-type grinding tool of claim 1, wherein the
 cover plate portion has a slot extending from a position
 radially inward of the inner peripheral surface of
 the outer peripheral portion to a position radially

outward of the inner peripheral surface of the outer peripheral portion, the inner opening portion and the outer opening portion each being formed as a part of the slot.

3. The belt-type grinding tool of claim 2, wherein the slot is curved with respect to a radial direction about the rotation axis.

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4. The belt-type grinding tool of claim 2 or 3, wherein the slot has a size such that a human finger cannot enter the slot.

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5. The belt-type grinding tool of any one of claims 1 to 4, wherein the drive pulley further includes a center secured portion connected to a rotating shaft drivably connected to the motor, and a connecting portion extending from the outer peripheral portion to the center secured portion, the connecting portion having a through-hole extending therethrough in the direction of the rotation axis, wherein the airflow path is configured to pass through the through-hole.

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6. The belt-type grinding tool of claim 5, wherein when the fan is rotated, outside air is sucked into the accommodating space from the inner opening portion to flow along the airflow path such that the air passes through inside the outer peripheral portion, passes through the through-hole, turns around the other side end edge of the outer peripheral portion, passes through outside the outer peripheral portion, and is discharged to the outside of the accommodating space from the outer opening portion.

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7. The belt-type grinding tool of claim 5 or 6, wherein the fan has a plurality of blades arranged at a first space in a circumferential direction of the outer peripheral portion, and the through-hole includes a plurality of the through-holes arranged in the circumferential direction at a second space, the first space and the second space are different from one another.

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8. The belt-type grinding tool of any one of claims 5 to 7, wherein a gap in the direction of the rotation axis is formed between the fan and the connecting portion of the drive pulley.

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9. A belt-type grinding tool comprising:

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a tool body including a motor;

an idle pulley rotatably attached to the tool body;

a drive pulley to be rotatably driven by the motor and having a cylindrical outer peripheral portion configured to support an endless grinding belt wound between the drive pulley and the idle pulley;

a fan at least partially disposed radially inside the outer peripheral portion, the fan being con-

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figured to rotate together with the drive pulley to generate a flow of air passing through inside the outer peripheral portion in a direction of a rotation axis of the drive pulley; and

a cover having a cover plate portion disposed adjacent to one side end edge of the outer peripheral portion in the direction of the rotation axis, the cover defining between itself and the tool body an accommodating space accommodating the drive pulley, the cover plate portion having a slot extending from an inner opening portion to an outer opening portion, the inner opening portion opening into the accommodating space at a position radially inward of an inner peripheral surface of the outer peripheral portion, the outer opening portion opening into the accommodating space at a position radially outward of the inner peripheral surface of the outer peripheral portion;

wherein when the fan is rotated, outside air is sucked into the accommodating space from the slot to pass through inside the outer peripheral portion and discharged to an outside of the accommodating space.

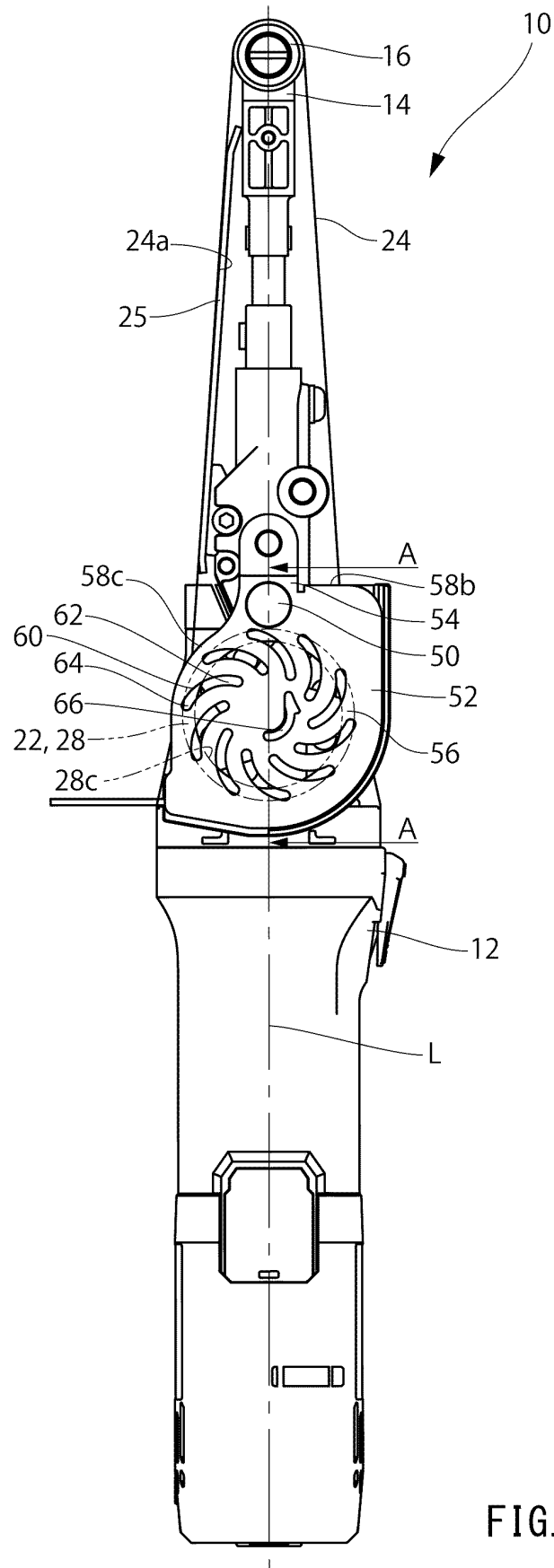


FIG. 1

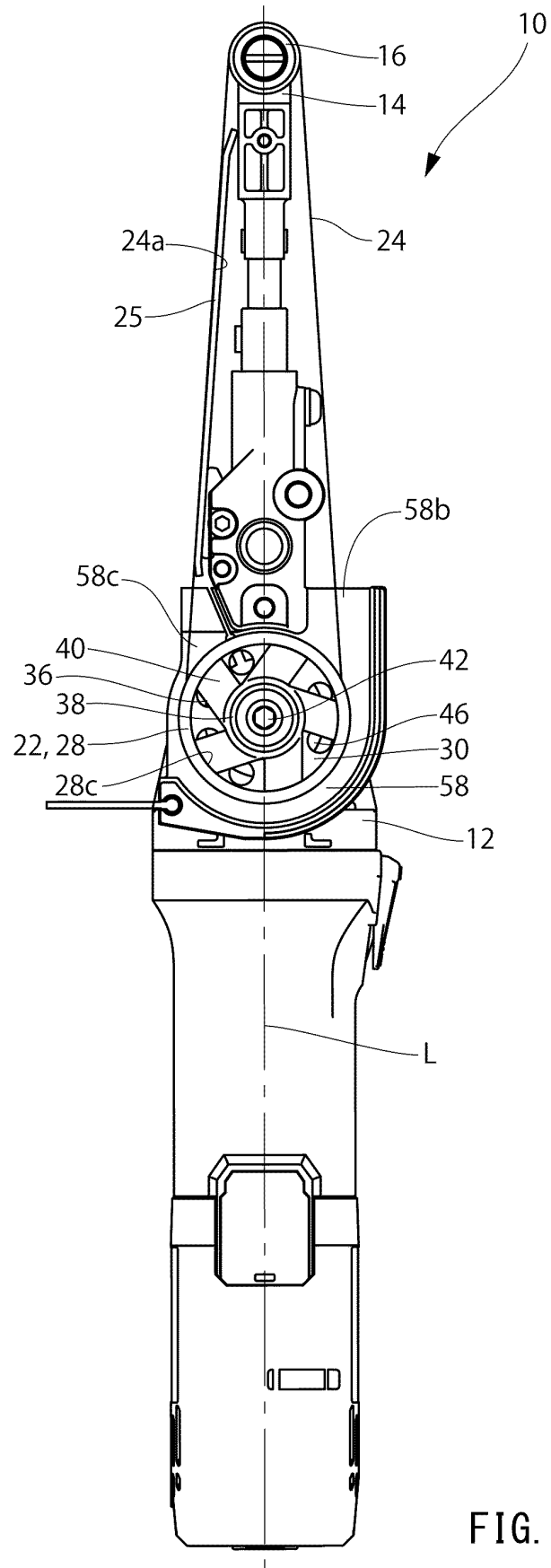


FIG. 2

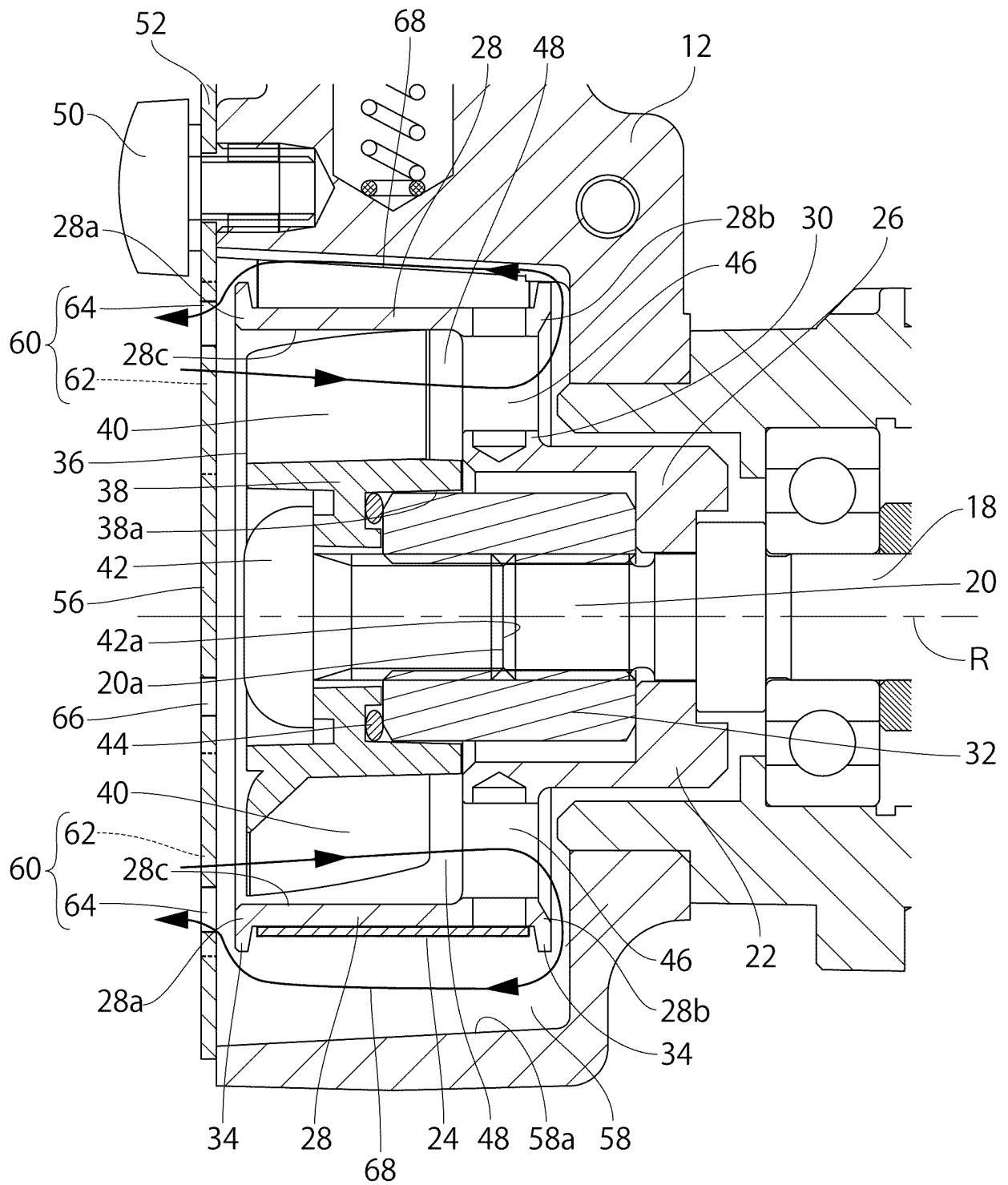


FIG. 3

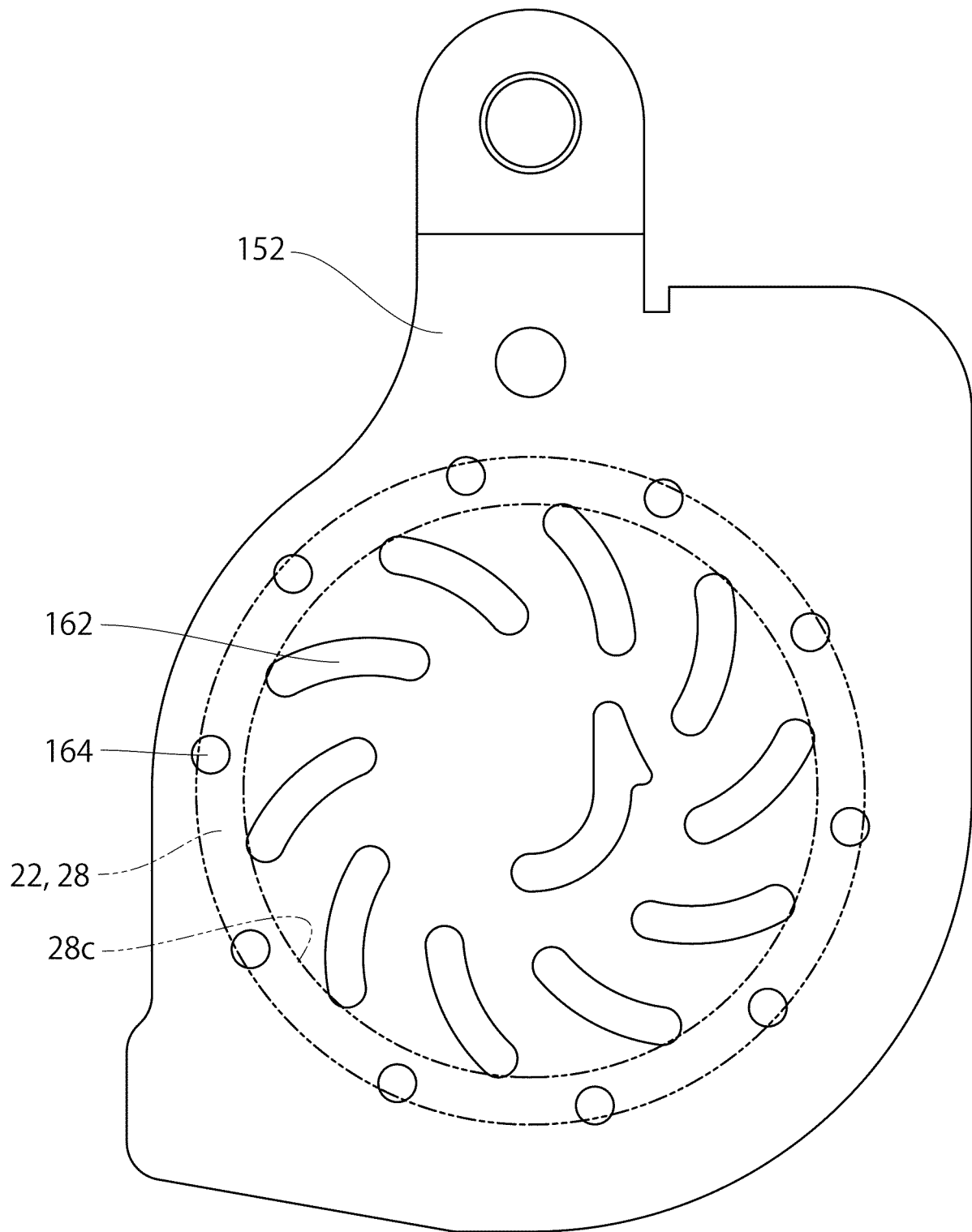


FIG. 4

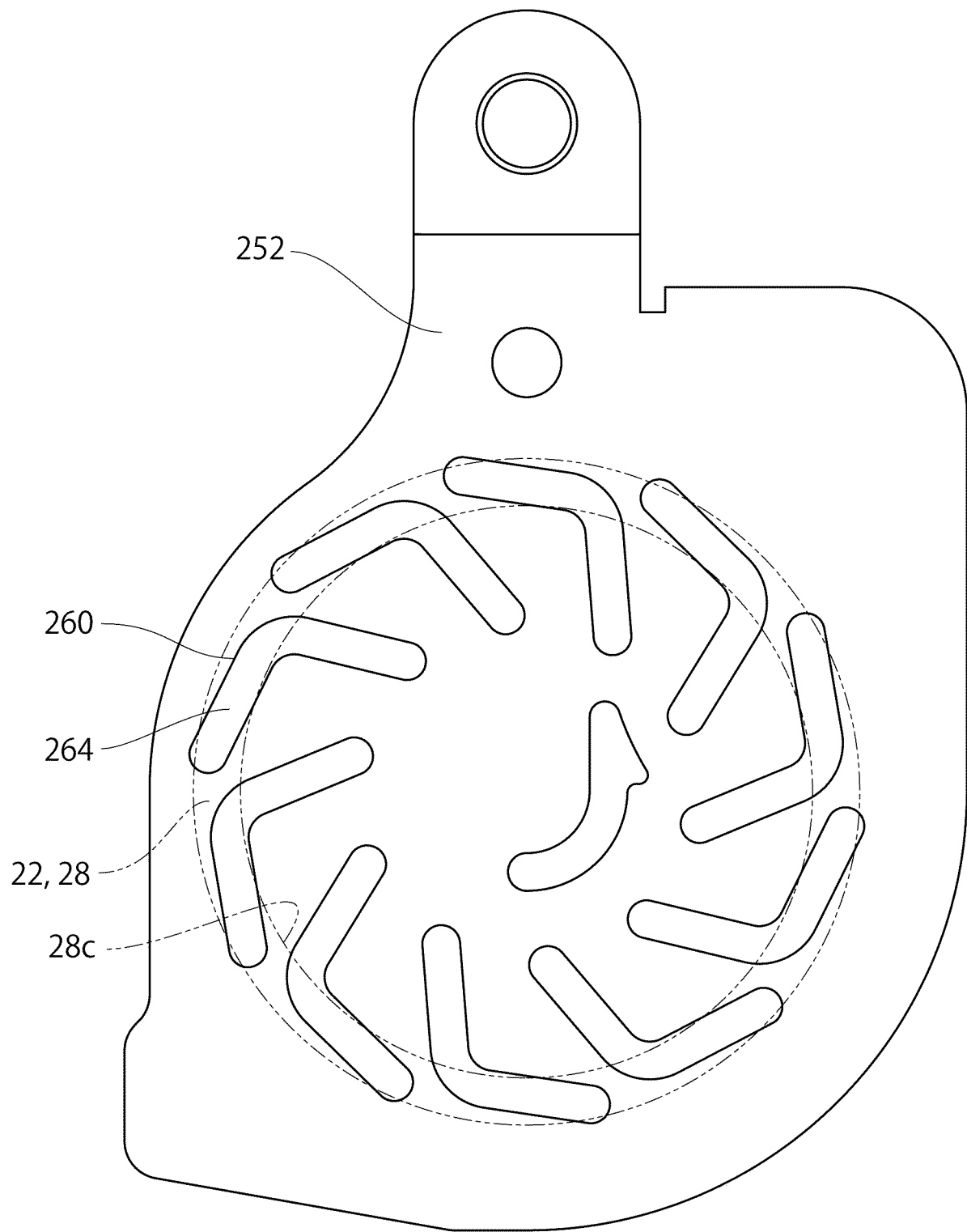


FIG. 5

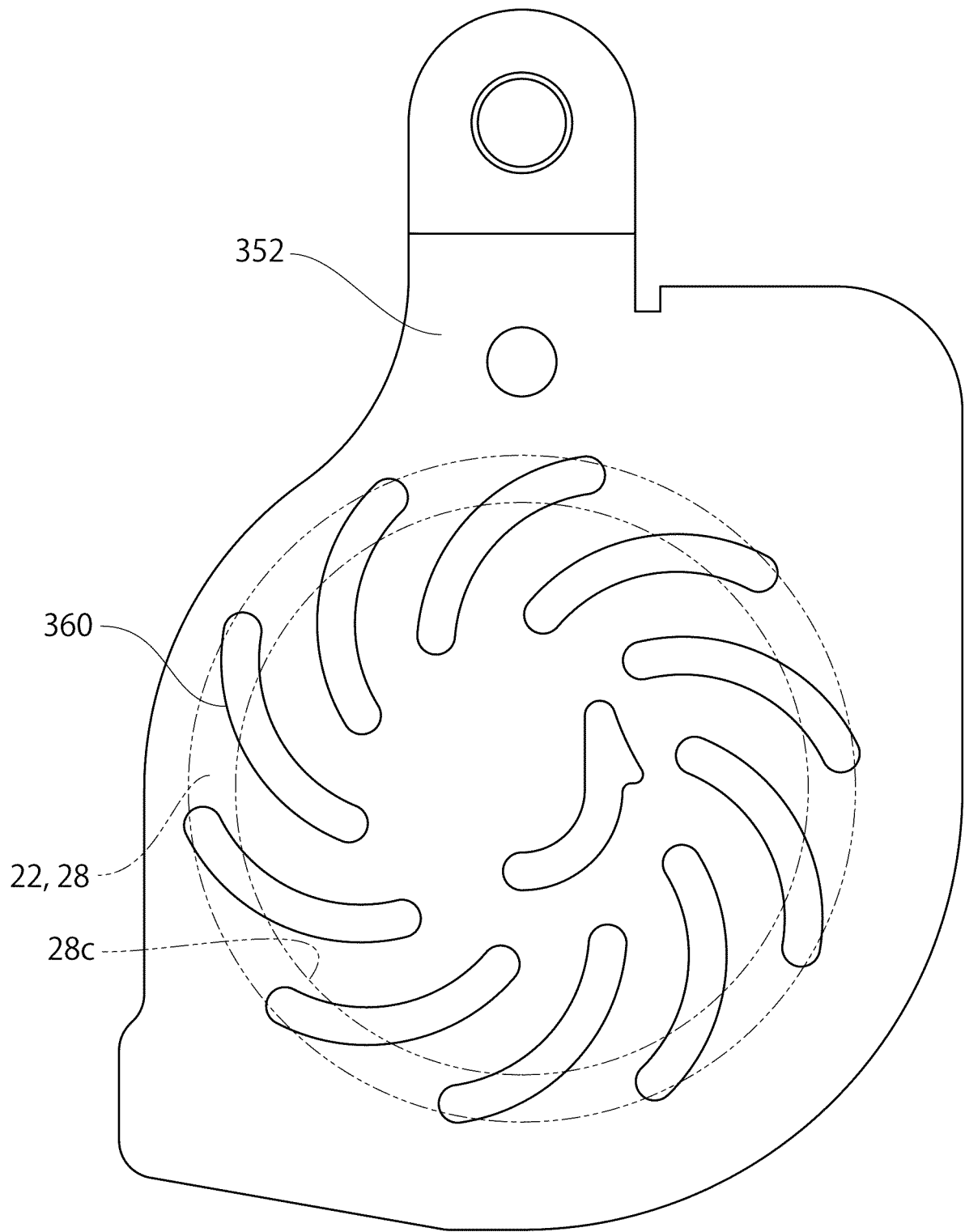


FIG. 6

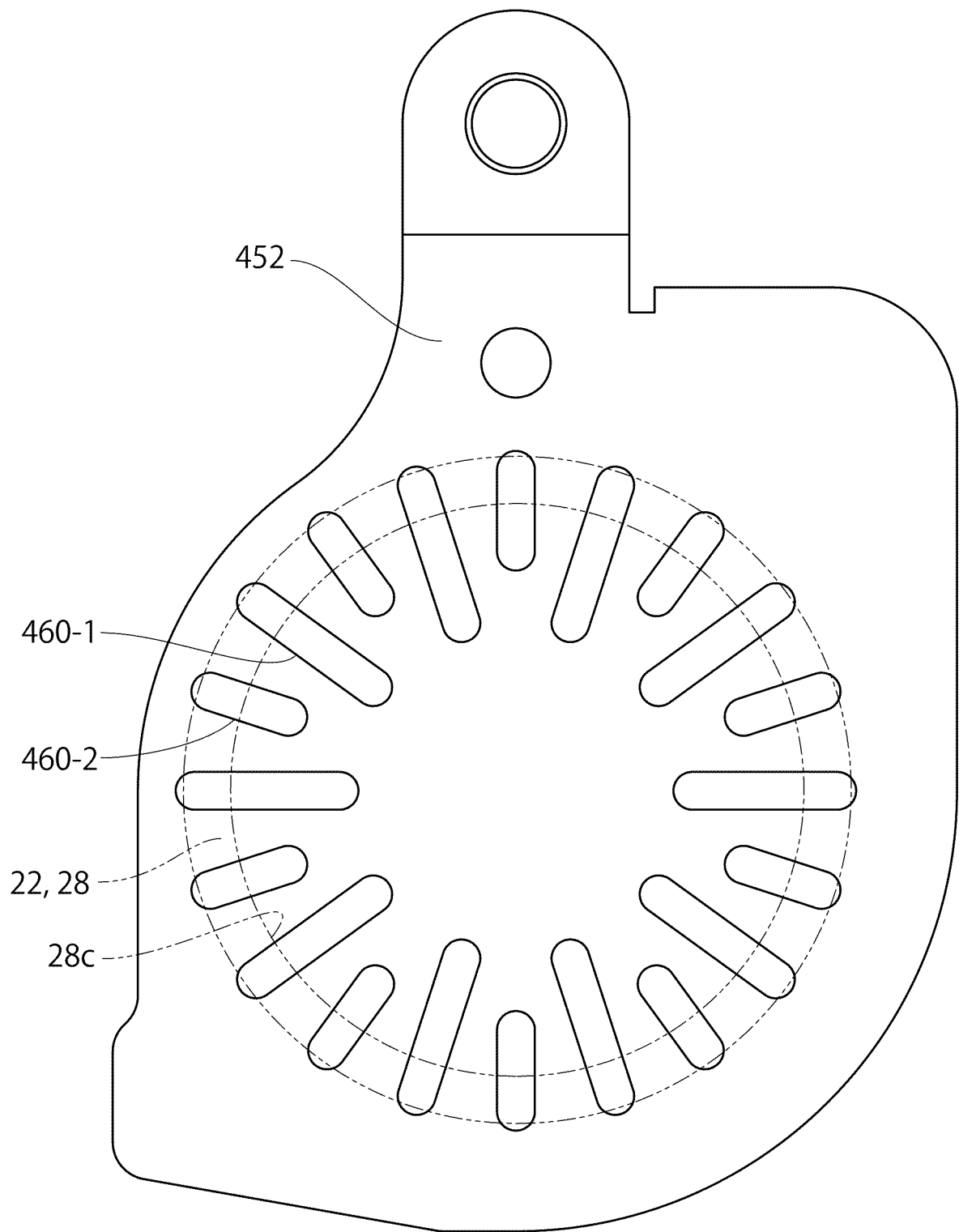


FIG. 7

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2019/013541

A. CLASSIFICATION OF SUBJECT MATTER

Int.Cl. B24B23/06 (2006.01) i, B24B55/02 (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)

Int.Cl. B24B3/00-3/60, 21/00-39/06, 55/02

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

Published examined utility model applications of Japan 1922-1996

Published unexamined utility model applications of Japan 1971-2019

Registered utility model specifications of Japan 1996-2019

Published registered utility model applications of Japan 1994-2019

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 122238/1986 (Laid-open No. 30463/1988) (MAKITA DENKI SEISKKUSHO KK) 27 February 1988, page 2, line 5 to page 7, line 18, fig. 1-3 (Family: none)	1-9
A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 14175/1980 (Laid-open No. 115758/1980) (BLACK & DECKER, INC.) 15 August 1980, page 18, line 2 to page 19, line 8, fig. 4-5 (Family: none)	1-9
A	JP 2014-166668 A (NITTO KOHKI CO., LTD.) 11 September 2014, entire text, all drawings & US 2015/0360339 A1, entire text, all drawings & WO 2014/133162 A1	1-9

☐ Further documents are listed in the continuation of Box C.
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Date of the actual completion of the international search

11 June 2019 (11.06.2019)

Date of mailing of the international search report

18 June 2019 (18.06.2019)

 Name and mailing address of the ISA/
 Japan Patent Office
 3-4-3, Kasumigaseki, Chiyoda-ku,
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Patent documents cited in the description

- JP 2014166668 A [0004]