(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 2 224 136 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
01.09.2010 Bulletin 2010/35

(51) Int Cl.:
F04C 18/02 *(2006.01)* ***F04C 29/04*** *(2006.01)*

(21) Application number: **10154850.1**

(22) Date of filing: **26.02.2010**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO SE SI SK SM TR

(30) Priority: **27.02.2009 JP 2009045489**

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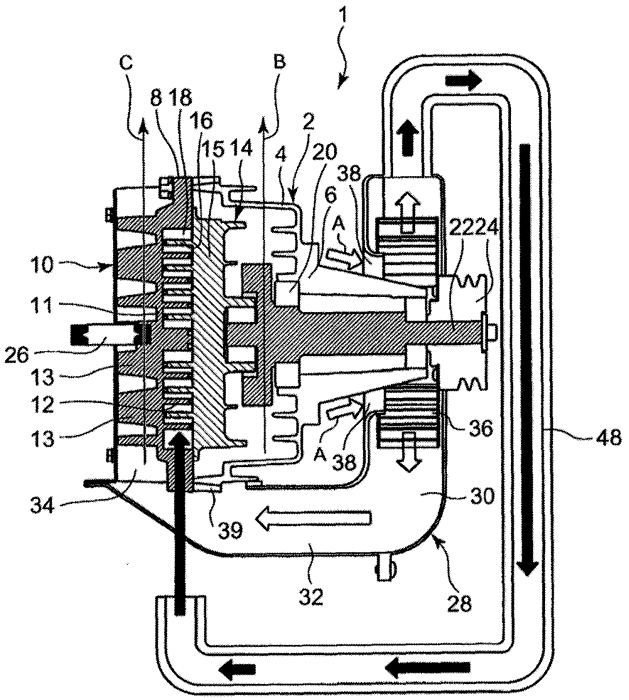
(54) Air-cooled scroll compressor

(57) An air-cooled scroll compressor comprises a cooling fan attached to the drive shaft, a cooling air duct for introducing air discharged from the cooling fan to at least one of the back side of the revolving scroll and front side of the stationary scroll to cool, the spiral wraps of both scrolls mating with each other and forming compression chambers for compressing gas between them, wherein an inlet air duct for introducing a part of air discharged from the cooling fan is connected to an inlet port of the scroll compressor at an peripheral part of said stationary scroll so that a part of the air discharged from the cooling fan can be introduced to said compression chambers.

Fig. 1



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Description

Technical Field

[0001] The present invention relates to an air-cooled scroll-type compressor, specifically an air-cooled scroll-type compressor provided with a cooling fan for cooling the revolving scroll and stationary scroll thereof.

Related Art

[0002] Scroll-type compressors have been known as compressors used for compressing air, and compressing refrigerant in refrigerators and air conditioners. Scroll compressors are generally comprised of a revolving scroll member including an end plate and a spiral wrap extending perpendicular from one surface (mirror surface) of the end plate, a stationary scroll member including an end plate and a spiral wrap extending perpendicular from one surface (mirror surface) of the end plate, and a drive shaft supported by a compressor casing rotatably, the drive shaft having a crank pin on which the revolving scroll member is supported rotatably. The stationary scroll member and revolving scroll member are assembled so that the spiral wraps of both scroll members mate with each other and enclosed spaces, i.e. compression chambers, are formed between both the spiral wraps.

[0003] When the drive shaft is rotated, the revolving scroll revolves with respect to the stationary scroll. As the revolving scroll revolves, spaces between the wraps move toward the center of the scrolls reducing in volume, so gas sucked in the spaces between the spiral wraps is compressed to be discharged from a discharge port in the center of the stationary scroll.

[0004] The gas sucked in the compression chambers is compressed and raised in temperature by the compression as the revolving scroll rotates. The revolving and stationary scrolls are heated by the gas raised in temperature by the compression. Therefore, it is necessary to cool the revolving and stationary scrolls.

[0005] A scroll compressor provided with a cooling means for cooling the revolving and stationary scrolls is disclosed in patent document 1, for example. FIG.7 is schematic representation of construction of the scroll compressor disclosed in the patent document 1. In the drawing, a scroll compressor body 102 comprised of a revolving scroll 110, stationary scroll 108, a casing 104 covering the revolving scroll 110(the revolving scroll is supported by the casing 104 therein and can't be seen in the drawing), and a drive shaft 116 for driving the revolving scroll 110. A centrifugal fan 106 is attached to the drive shaft 116. The centrifugal fan 106 is covered by a fan cowling which is connected with a fan duct 114 to the outer periphery of the scroll compressor body 102. Cooling air is sucked through a suction opening 118 of the fan cowling and discharged through a discharge part 120 in the outer peripheral part of the centrifugal fan 116. Cooling air discharged from the centrifugal fan 106 is introduced through the fan duct 114 to the scroll compressor body 102 to cool the stationary and revolving scrolls. A flow diverter guide 124 is provided in the fan duct 114 to guide the cooling air so that cooling air flow to the revolving scroll 110 is larger than cooling air flow to the stationary scroll 108.

[0006] In the scroll compressor disclosed in the Patent Document 1, the scroll compressor body 102 is cooled by air introduced through the fan duct 114, however, there is disclosed no twist as to gas (air) introduced to the compressor body 102 to be compressed therein. As air of atmospheric pressure is introduced to the compressor body 102, increase of discharge air, i.e. increase of discharge air flow per unit power which results in energy saving can not be expected. Further, the stationary and revolving scrolls are heated by the heat generated when compressing gas (air) from atmospheric pressure to discharge pressure, and the device centrifugal compressor106 in FIG.7) required to cool the heated components of the scroll compressor have become large in size.

Related Art Document

[0007] Patent Document 1: Japanese Laid-Open Utility Model Publication No.2-94386.

Summary of the Invention

[0008] The present invention was made in light of the problems mentioned above, and the object of the invention is to provide an air-cooled scroll compressor of which the revolving scroll and stationary scroll can be cooled without increase in size of cooling device, and with which increase of discharge air, i.e. increase of discharge air flow per unit power which results in energy saving can be achieved and temperature of the discharged air can be decreased owing to decreased compression ratio.

[0009] To achieve the object, the present invention proposes an air-cooled scroll compressor comprising a revolving scroll including an end plate and a spiral wrap extending perpendicular from one surface (mirror surface) of the end plate, a stationary scroll including an end plate and a spiral wrap extending perpendicular from one surface (mirror surface) of the end plate, a drive shaft having a crank portion for revolving said revolving scroll with respect to said stationary scroll, a compressor casing connected to said stationary scroll to cover said revolving scroll, a cooling fan attached to said drive shaft, a cooling air duct for introducing air discharged from the cooling fan to at least one of the back side of said revolving scroll and front side of said stationary scroll, the spiral wraps of both scrolls mating with each other and forming compression chambers between them, wherein an inlet air duct for introducing a part of air discharged from the cooling fan is connected to an inlet port of the scroll compressor at an peripheral part of said stationary scroll so

that a part of the air discharged from the cooling fan can be introduced to said compression chambers.

[0010] By introducing a part of positive pressure air produced by the cooling fan attached to the drive shaft to the inlet port of the scroll compressor, the compressor sucks inlet air of pressure higher than atmospheric pressure. By introducing air of positive pressure, discharge air flow per unit power can be increased, which results in energy saving.

[0011] It is preferable that said inlet air duct is provided separately from said cooling air duct such that the inlet air duct takes a route at a distance from said cooling air duct and connected to the inlet port of the scroll compressor, thereby introducing a part of air discharged from the cooling fan to said compression chambers.

[0012] In this way, cooling air is introduced to the front side of the stationary scroll and back side of the revolving scroll through the cooling air duct to cool the scrolls, and a part of cooling air discharged from the cooling fan with its pressure increased through the fan is introduced through the inlet air duct to the inlet port of the scroll compressor. Therefore, air of positive pressure is sucked in the compression chambers, so required discharge pressure can be obtained by smaller compression ratio in comparison with a case air of atmospheric pressure is sucked. Accordingly, the air-cooled scroll compressor can discharge increased amount of compressed air and discharge air flow per unit power can be increased resulting in energy saving, and temperature of discharge air can be decreased.

[0013] Further, as the inlet air duct is connected to the inlet port which is positioned on the outer periphery of the stationary scroll, the inlet air duct can be connected from the cooling fan to the inlet port easily without complexifying the piping.

Therefore, an existing scroll compressor having no inlet air duct as mentioned above can be modified easily to a compressor according to the invention.

[0014] Further, by providing the inlet air duct in a line separate from the cooling air duct line in a state not branching from the cooling air duct, air flow in the cooling air duct is not affected by the air flow in the inlet air duct, and fluctuation such as pulsation is not generated in the air flow in the cooling air duct, so the revolving scroll and stationary scroll can be cooled stably.

[0015] It is preferable that a dust removing means for removing dust in the air flowing in said inlet air duct is provided thereon. Depending on usage of the compressed air compressed by an air-cooled scroll compressor, dust-free compressed air is demanded in many cases. By providing the dust removing means, dust in the air introduced into the compression chambers can be removed and dust-free compressed air can be obtained. As the dust removing means, an air filter can be used for example.

By this, occurrence of scuffing on the spiral wraps and abrasion of the chip seals and so on can be suppressed and sealing function of the chip seals can be maintained good for longer periods, and energy saving effect due to increased air flow per unit power can be maintained stably for longer periods.

[0016] It is preferable that said inlet air duct can be detached for replacement. This enables that a plurality of inlet air ducts of various cross-section area are provided and the inlet air duct of an air-cooled scroll compressor is replaced by one most suited to operation condition of the compressor.

[0017] It is preferable that a means for enabling varying cross-section area of said inlet air duct is provided thereon.

By this, air passage area of the inlet air duct can be controlled to suit operation condition of the air-cooled scroll compressor.

[0018] It is also suitable that said inlet air duct is a branch duct branched from said cooling air duct, and the branch duct is connected to said inlet port of the scroll compressor so that a part of air discharged from the cooling fan and flowing in the cooling air duct can be introduced to the compression chambers through the branch duct.

[0019] Inlet air for the compressor is taken out from the cooling air duct by the branch duct branched from the cooling air duct and introduced to the inlet port of the scroll compressor. Air flowing in the cooling air duct is raised in pressure above atmospheric pressure by the cooling fan, so air of positive pressure is sucked in the compression chambers of the scroll compressor. Therefore, required discharge pressure can be obtained by smaller compression ratio in comparison with a case air of atmospheric pressure is sucked. Accordingly, the air-cooled scroll compressor can discharge increased amount of compressed air and discharge air flow per unit power can be increased resulting in energy saving, and temperature of discharge air can be decreased.

[0020] As the cooling air duct is connected to the outer periphery of the stationary scroll and the branch duct as an inlet air duct is connected to the inlet port which is positioned on the outer periphery of the stationary scroll, the branch duct branched from the cooling air duct can be connected to the inlet port easily without complexifying the piping. Therefore, an existing scroll compressor having no inlet air duct as mentioned above can be modified easily to a compressor according to the invention.

[0021] It is preferable that a dust removing means for removing dust in the air flowing in said branch duct is provided thereon.

By providing the dust removing means, dust in the air introduced into the compression chambers can be removed and dust-free compressed air can be obtained. Therefore, occurrence of scuffing on the spiral wraps and abrasion of the chip seals and so on can be suppressed and sealing function of the chip seals can be maintained good for longer periods, and energy saving effect due to increased air flow per unit power can be maintained stably for longer periods.

[0022] It is preferable that an air duct for introducing

air discharged from a fan of a motor for driving the drive shaft into said branch duct is provided.

With this construction, air discharged from the fan of the motor is introduced to the branch duct and introduced to the inlet port of the scroll compressor together with the air branched from the cooling air duct. In this way, the air discharged from the fan of the motor can be utilized effectively. Furthermore, as the air discharged from the fan of the motor is introduced to the branch duct, air flow branched from the cooling air duct to the branch duct to be introduced to the inlet port of the scroll compressor can be decreased, as a result air flow supplied from the cooling air duct to cool the scrolls can be secured enough. The air discharged from the fan of the motor is raised in pressure to above atmospheric pressure, so the air can be introduced to the branch duct without problem.

[0023] As has been described heretofore, according to the invention, the revolving scroll and stationary scroll of an air-cooled scroll compressor can be cooled without increase in size of the cooling device, increase of discharge airflow per unit power which result in energy saving can be achieved, and temperature of the discharged air can be decreased owing to decreased compression ratio.

Brief Description of the Drawings

[0024]

Figure 1 is a longitudinal cross sectional view of the air-cooled scroll compressor of the first embodiment.

Figure 2 is a longitudinal cross sectional view of the air-cooled scroll compressor of the second embodiment.

Figure 3 is a longitudinal cross sectional view of the air-cooled scroll compressor of the third embodiment

Figure 4 is a longitudinal cross sectional view of the air-cooled scroll compressor of the fourth embodiment.

Figure 5 is a longitudinal cross sectional view of the air-cooled scroll compressor of the fifth embodiment.

Figure 6 is a longitudinal cross sectional view of the air-cooled scroll compressor of the sixth embodiment.

Figure 7 is a schematic representation showing construction of a conventional air-cooled scroll compressor.

Detailed Description of the Embodiments

[0025] Preferred embodiments of the present invention will now be detailed with reference to the accompanying drawings. It is intended, however, that unless particularly specified, dimensions, materials, relative positions and so forth of the constituent parts in the embodiments shall be interpreted as illustrative only not as limitative of the scope of the present invention.

[The first embodiment]

(Construction)

[0026] FIG.1 is longitudinal cross sectional view of the air-cooled scroll compressor of the first embodiment.

First, construction of the air-cooled scroll compressor of the first embodiment will be explained referring to FIG.1.

In FIG.1, reference numeral 2 is a compressor casing forming the outer frame of an air-cooled scroll compressor 1. The compressor casing 2 composed of a casing body part 4 and a cylindrical bearing support part 6 extending from the casing body part 4.

[0027] Reference numeral 8 shows a compressing part of the air-cooled scroll compressor 1. The compressing part 8 includes a stationary scroll 10 and a revolving scroll 14 disposed facing the stationary scroll 10. The compressor casing 2 is connected to the stationary scroll and its casing body part 4 covers the revolving scroll 14. A drive shaft 22 is supported for rotation by the bearing support part 6 of the compressor casing 2 by the intermediary of a bearing 20. The drive shaft 22 has a decentered crank pin protruding from an end thereof on which revolving scroll 14 is supported rotatably by the intermediary of a bearing. A pulley 24 is attached to the other end side of the drive shaft 22 protruding from the bearing support part 6. The drive shaft 22 is belt-driven by a motor not shown in the drawing by the intermediary of the pulley. The drive shaft 22 may be connected to the motor directly by means of a shaft coupling.

[0028] The stationary scroll 10 includes an end plate 11 having a mirror surface from which a spiral wrap 12 extends perpendicular thereto and a plurality of heat radiation fins 13 extending perpendicular from the front surface, the other side surface of the mirror surface of the end plate 11. The spiral wrap 12 starts to spiral from the center part of the end plate 11 outwardly. Reference numeral 26 indicates an outlet port of compressed gas provided at the center part of the end plate 11 of the stationary scroll 10.

[0029] The revolving scroll 14 includes an end plate 15 having a mirror surface from which a spiral wrap 16 extends perpendicular thereto. The spiral wrap 16 starts to spiral from the center part of the end plate 15 outwardly. A chip seal not shown in the drawing is received in a groove formed on the top face of each of the spiral wraps 12 and 16.

[0030] The spiral wrap 16 of the revolving scroll 14 revolves without rotating itself in a state rotated by 180° relative to the spiral wrap 12 of the stationary scroll. Crescent-shaped compression chambers 18 are formed between the spiral wraps of the stationary and revolving scrolls.

[0031] By rotating the drive shaft 22 by a motor (not shown) by a belt (not shown) and the pulley 24 attached to the drive shaft 22, the revolving scroll 14 supported rotatably on the crank pin of the drive shaft 22 revolves with respect to the stationary scroll with a revolving radius

of the crank radius (eccentric radius of the crank pin) without rotating itself. Compression chambers formed between the spiral wraps reduce in volume as the chambers move toward the center of the scrolls as the revolving scroll revolves. Air sucked from outward of the spiral wraps of the stationary and revolving scrolls 10 and 14 is compressed toward the center side and discharged from the outlet port 26 to be supplied to a demanding side as the drive shaft 22 rotates.

[0032] Reference numeral 36 is a centrifugal fan (sirocco fan) attached to the pulley 24. Reference numeral 30 is a fan cowling continuing to a cooling air duct 28 and further continuing to a cooling air duct 32. The cooling air duct 32 is connected to the casing body part 4 of the compressor casing 2 and a front cover plate of the stationary scroll 10 covering the heat radiation fins 13 of the stationary scroll to form a cooling air passage for cooling the stationary scroll.

[0033] Air sucked by the sirocco fan 36 through an air suction opening 38 formed between an opening of the fan cowling 30 and the outer periphery of the bearing support part 6 is discharged from the outer circumference of the fan. The discharged air is introduced through the duct 28 and 32 to an inlet opening 39 of the casing body part 4 of the compressor casing 2 to be flown to the back side of the revolving scroll 14 and to an inlet opening 34 between the front cover plate of the stationary scroll 10 and front end face thereof to be flown to the front side of the stationary scroll.

[0034] The centrifugal fan 36 which is composed as a sirocco fan having a number of vanes arranged circumferentially in the peripheral part of the fan is attached to the pulley 24 fixed to the drive shaft and rotated together with the drive shaft 22. Outside air sucked from the suction opening 38 as shown by an arrow A is discharged from the outer circumference of the fan to be flown through the duct 28 and 32 as cooling air to cool the scrolls.

[0035] Reference numeral 48 is an inlet air duct provided to introduce a part of air discharged from the centrifugal fan 36 to the inlet port of the scroll compressor. The air introduced in the compressor is sucked into the compression chambers 18 formed between the spiral wraps. The inlet air duct 48 is connected to the fan cowling 30 at an upper part of outer periphery thereof, a part opposite to the part where the duct 28 is connected.

Air flow rate in the inlet air duct 48 can be adjusted by determining the passage diameter of the inlet air duct 48 so that air flows at a prescribed flow rate, or by providing a control valve to control the flow rate of air through the inlet air duct 48 and adjusting the opening of the valve.

(Operation)

[0036] Operation of the scroll compressor of the first embodiment constructed as described above will be explained hereunder.

[0037] First, compression operation of the compressor will be explained. The drive shaft 22 is rotated by a motor (not shown) by the intermediary of a belt (not shown) and the pulley 24. The revolving scroll 14 revolves as the drive shaft 22 rotates. As the revolving scroll 14 revolves, volume of compression chambers 18 formed between the spiral wrap 12 of the stationary scroll 10 and the spiral wrap 16 of the revolving scroll 14 is reduced continuously toward the center of the scrolls. Air of positive pressure discharged from the centrifugal fan and introduced through the inlet air duct 48 to the inlet port of the scroll compressor is trapped in the compression chambers 18 formed between the spiral wraps 12 and 16, compressed in the compression chambers 18 as the revolving scroll revolves, and discharged from the outlet opening 26 to a demanding side.

[0038] Next, cooling operation of the air-cooled scroll compressor will be explained.

When the drive shaft 22 is rotated by means of a motor (not shown) by the intermediary of a belt (not shown) and the pulley 24, the revolving scroll 14 revolves and concurrently the centrifugal fan 36 is rotated. When the centrifugal fan 36 rotates, outside air is sucked through the air suction opening 38 and discharged from the peripheral part of the centrifugal fan 36 to the duct 28. The air discharged to the duct 28 flows in the cooling air duct 32.

[0039] A part of the air flowing in the cooling air duct 32 is introduced through the inlet opening 39 to the back side of the revolving scroll 14 to cool the revolving scroll. A part of the air flowing in the cooling air duct 32 is introduced through the inlet opening 34 to the front side of the stationary scroll 10 to cool the stationary scroll. The air having cooled the revolving scroll 14 and stationary scroll 10 is exhausted outside as shown by arrows B and C.

The part of the air flowing in the duct 32 may be introduced to at least one of the back side of the revolving scroll 14 or to the front side of the stationary scroll 10.

[0040] The air flowing in the inlet air duct 48 is introduced to the compression chambers 18 from outside the spiral wraps 12 and 16. The compression chambers 18 move toward the center of the scrolls reducing in volume and increasing in pressure as the revolving scroll 14 revolves and compressed air is discharged from the outlet opening 26 at the center part of the stationary scroll 10 to be supplied to a demanding side.

[0041] As has been described in the foregoing, a part of the air discharged from the centrifugal fan 36 is introduced to at least one of the back side of the revolving scroll 14 and the front side of the stationary scroll 10 to cool the revolving scroll 14, so the revolving scroll 14 and stationary scroll 10 can be cooled. Therefore, the revolving scroll 14 and stationary scroll 10 are prevented from becoming high in temperature heated by the heat generated by the compression of air in the compression chambers 18.

[0042] Further, the remaining part of the air discharged from the centrifugal fan 36 is introduced to the compression chambers 18 through the inlet air duct 48. The air

discharged from the centrifugal fan 36 is raised in pressure to above atmospheric pressure. By supplying this air of positive pressure to the compressor as inlet air, compressed air of desired pressure can be obtained by a smaller compression ratio in comparison with a case that air of atmospheric pressure is sucked. Accordingly, the air-cooled scroll compressor 1 can discharge increased amount of compressed air and discharge air flow per unit power can be increased, resulting in energy saving. Furthermore, temperature of the discharged compressed air can be decreased by decreased compression ratio in the compressor.

[0043] With the first embodiment, the inlet air duct 48 for introducing a part of the air discharged from the centrifugal fan 36 is connected directly to the fan cowling 30 at the opposite side of the duct 28, not branched from the duct 28 or 32. Therefore, fluctuation such as pulsation is not generated in the air flow in the duct 32, so the revolving scroll 14 and stationary scroll 10 are cooled stably.

[0044] As the air supplied to the compression chambers 18 is introduced from the outer periphery of the stationary scroll 10, connection of the fan outlet to the outer periphery of the stationary scroll 10 is easily achieved by providing the inlet air duct 48.

[The second embodiment]

[0045] Figure 2 is a longitudinal cross sectional view of the air-cooled scroll compressor of the second embodiment.

In this second embodiment, a dust removing device 52 is disposed in the inlet air duct 48 and other than that is the same as to construction and operation to the air-cooled scroll compressor of the first embodiment of FIG. 1. Now therefore, explanation of the construction and operation of the second embodiment same to the first embodiment of FIG.1 will be omitted. Constituent parts same to those of the first embodiment are denoted by the same reference numerals.

[0046] In the air-cooled scroll compressor 1 of the second embodiment shown in FIG. 2, a dust removing device 52 is provided to the inlet air duct 48. The dust removing device 52 is composed of a casing 56 and a filter 54 which is disposed in the casing 56 to remove dust in the air passing through the casing 56. By providing the dust removing device 52, dust-free air can be introduced to the compression chambers 18. Depending on usage of the compressed air compressed by air-cooled scroll compressor 1, dust-free compressed air is demanded in many cases. However, the air flowing in the inlet air duct 48 is outside air sucked through the air suction opening 38, so it is likely that foreign matter such as dust is contained in the air sucked through the air suction opening 38. By providing the dust removing device 52 to the inlet air duct 48, inclusion of foreign matter such as dust in the inlet air can be prevented and dust-free air can be supplied to the compression chambers 18. Furthermore, occurrence of scuffing on the spiral wraps 12, 16, and abrasion of the chip seals and so on can be suppressed and sealing function of the chip seals can be maintained good for longer periods. Therefore, energy saving effect due to increased air flow per unit power can be maintained stably for longer period.

[The third embodiment]

[0047] Figure 3 is a longitudinal cross sectional view of the air-cooled scroll compressor of the third embodiment.

In this third embodiment, the inlet air duct of the first embodiment of FIG.1 is not provided and a branch duct 40 is provided as described later. Other than that is the same as to construction and operation to the first embodiment of the air-cooled scroll compressor. Now therefore, explanation of the construction and operation of the second embodiment same to the first embodiment will be omitted. Constituent parts same to those of the first embodiment of FIG.1 are denoted by the same reference numerals.

[0048] In the third embodiment of the air-cooled scroll compressor shown in FIG. 3, a branch duct 40 is provided which is branched from the duct 32 and connected to the inlet port of the scroll compressor to introduce a part of air flowing in the duct 32 to the compression chambers 18 of the scroll compressor 1.

Flow rate of air branched from the duct 32 to flow in the branch duct 40 can be adjusted by determining the passage diameter of the branch duct 40 so that air flows at a prescribed flow rate, or by providing a control valve to control the flow rate of air through the branch duct 40 and adjusting the opening of the valve.

[0049] As described above, air branched off from the air flowing in the duct 32 is introduced to the compression chambers 18 through the branch duct 40. The air discharged from the centrifugal fan 36 and flowing in the cooling air duct 32 is raised in pressure to above atmospheric pressure. By supplying a part of this air of positive pressure to the compressor as inlet air, compressed air of desired pressure can be obtained by a smaller compression ratio in comparison with a case that air of atmospheric pressure is sucked. Accordingly, the air-cooled scroll compressor 1 can discharge increased amount of compressed air and discharge air flow per unit power can be increased resulting in energy saving. Furthermore, temperature of the discharged compressed air can be decreased by decreasing compression ratio in the compressor.

[The fourth embodiment]

[0050] Figure 4 is a longitudinal cross sectional view of the air-cooled scroll compressor of the fourth embodiment.

In this forth embodiment, a dust removing device 42 is disposed in the branch duct 40 and other than that is the

same as to construction and operation to the air-cooled scroll compressor of the third embodiment of FIG.3. Now therefore, explanation of the construction and operation of the fourth embodiment same to the third embodiment of FIG. 3 will be omitted. Constituent parts same to those of the third embodiment of FIG. 3 are denoted by the same reference numerals.

[0051] In the fourth embodiment of the air-cooled scroll compressor 1 shown in FIG. 4, a dust removing device 42 is provided to the branch duct 40. The dust removing device 42 is composed of a casing 46 and a filter 44 which is disposed in the casing 46 to remove dust in the air passing through the casing 46. By providing the dust removing device 42, dust-free air can be introduced to the compression chambers 18. Depending on usage of the compressed air compressed by air-cooled scroll compressor 1, dust-free compressed air is demanded in many cases. However, the air flowing in the branch duct 40 branched from the cooling air duct 32 is outside air sucked through the air suction opening 38, so it is likely that foreign matter such as dust is contained in the air sucked through the air suction opening 38. By providing the dust removing device 42 to the branch duct 40, inclusion of foreign matter such as dust in the inlet air for the compressor can be prevented and dust-free air can be supplied to the compression chambers 18. Furthermore, occurrence of scuffing on the spiral wraps 12, 16, and abrasion of the chip seals and so on can be suppressed and sealing function of the chip seals can be maintained good for longer periods. Therefore, energy saving effect due to increased air flow per unit power can be maintained stably for longer period.

[The fifth embodiment]

[0052] Figure 5 is a longitudinal cross sectional view of the air-cooled scroll compressor of the fifth embodiment.

The fifth embodiment of the air-cooled scroll compressor 1 is the same as to construction and operation to the fourth embodiment of FIG.4 except drive method of the drive shaft 22. Now therefore, explanation of the construction and operation of the fifth embodiment same to the fourth embodiment will be omitted. Constituent parts same to those of the fourth embodiment of FIG.4 are denoted by the same reference numerals.

[0053] In FIG.5, the drive shaft 22 is connected directly to the rotor shaft of a motor 25 by means of a coupling so that the drive shaft 22 is direct-driven by the motor 25.

[The sixth embodiment]

[0054] Figure 6 is a longitudinal cross sectional view of the air-cooled scroll compressor of the sixth embodiment.

The sixth embodiment of the air-cooled scroll compressor 1 shown in FIG. 6 is the same to the fifth embodiment of FIG.5 except that an additional air duct 60 is provided as mentioned later. Now therefore, explanation of the construction and operation of the sixth embodiment same to the fifth embodiment will be omitted. Constituent parts same to those of the fifth embodiment of FIG.5 are denoted by the same reference numerals.

[0055] In FIG.6, an additional air duct 60 is provided to introduce air discharged from a fan 62 of the motor 25 to the branch duct 40. Air discharged from the fan 62 of the motor 25 is introduced to the branch duct 40 to be introduced to the compression chambers 18. Thus, air discharged from the fan 62 of the motor 25 can be utilized. Furthermore, as the air discharged from the fan 62 of the motor 25 is introduced to the branch duct 40, air flow branched off from the cooling air duct 32 to the branch duct 40 to be introduced to the inlet port of the scroll compressor can be decreased, as a result air flow supplied from the cooling air duct 32 to cool the scrolls can be secured enough.

The air discharged from the fan 62 of the motor 25 is raised in pressure to above atmospheric pressure, so the air can be introduced to the branch duct 40 without problem.

Industrial Applicability

[0056] An air-cooled scroll compressor can be provided of which the revolving scroll and stationary scroll can be cooled without increase in size of the cooling device, and with which increase of discharge air, increase of discharge air flow per unit power which results in increased energy saving can be achieved and temperature of the discharged air can be decreased owing to decreased compression ratio.

Claims

1. An air-cooled scroll compressor comprising,
a revolving scroll including an end plate and a spiral wrap extending perpendicular from one mirror surface of the end plate,
a stationary scroll including an end plate and a spiral wrap extending perpendicular from one mirror surface of the end plate,
a drive shaft having a crank portion for revolving said revolving scroll with respect to said stationary scroll,
a compressor casing connected to said stationary scroll to cover said revolving scroll,
a cooling fan attached to said drive shaft, and
a cooling air duct for introducing air discharged from the cooling fan to at least one of the back side of said revolving scroll and the front side of said stationary scroll,
the spiral wraps of both scrolls mating with each other and forming compression chambers between them:
wherein an inlet air duct for introducing a part of air discharged from the cooling fan is connected to an inlet port of the scroll compressor at an peripheral

part of said stationary scroll so that a part of the air discharged from the cooling fan can be introduced to said compression chambers.

2. An air-cooled scroll compressor according to claim 1, wherein said inlet air duct is provided separately from said cooling air duct such that the inlet air duct takes a route at a distance from said cooling air duct and connected to the inlet port of the scroll compressor, thereby introducing a part of air discharged from the cooling fan to said compression chambers.

3. An air-cooled scroll compressor according to claim 2, wherein a dust remover for removing dust in the air flowing in said inlet air duct is provided thereon.

4. An air-cooled scroll compressor according to claim 2 or 3, wherein said inlet air duct can be detached for replacement.

5. An air-cooled scroll compressor according to claim 2 or 3, wherein a means for enabling varying cross-section area of said inlet air duct is provided thereon.

6. An air-cooled scroll compressor according to claim 1, wherein said inlet air duct is a branch duct branched from said cooling air duct, and the branched duct is connected to said inlet port of the scroll compressor so that a part of air discharged from the cooling fan can be introduced to the compression chambers through the branch duct.

7. An air-cooled scroll compressor according to claim 6, wherein a dust remover for removing dust in the air flowing in said branch duct is provided thereon.

8. An air-cooled scroll compressor according to claim 6 or 7, wherein an air duct for introducing air discharged from a fan of a motor for driving the drive shaft into said branch duct is provided.

Fig. 1

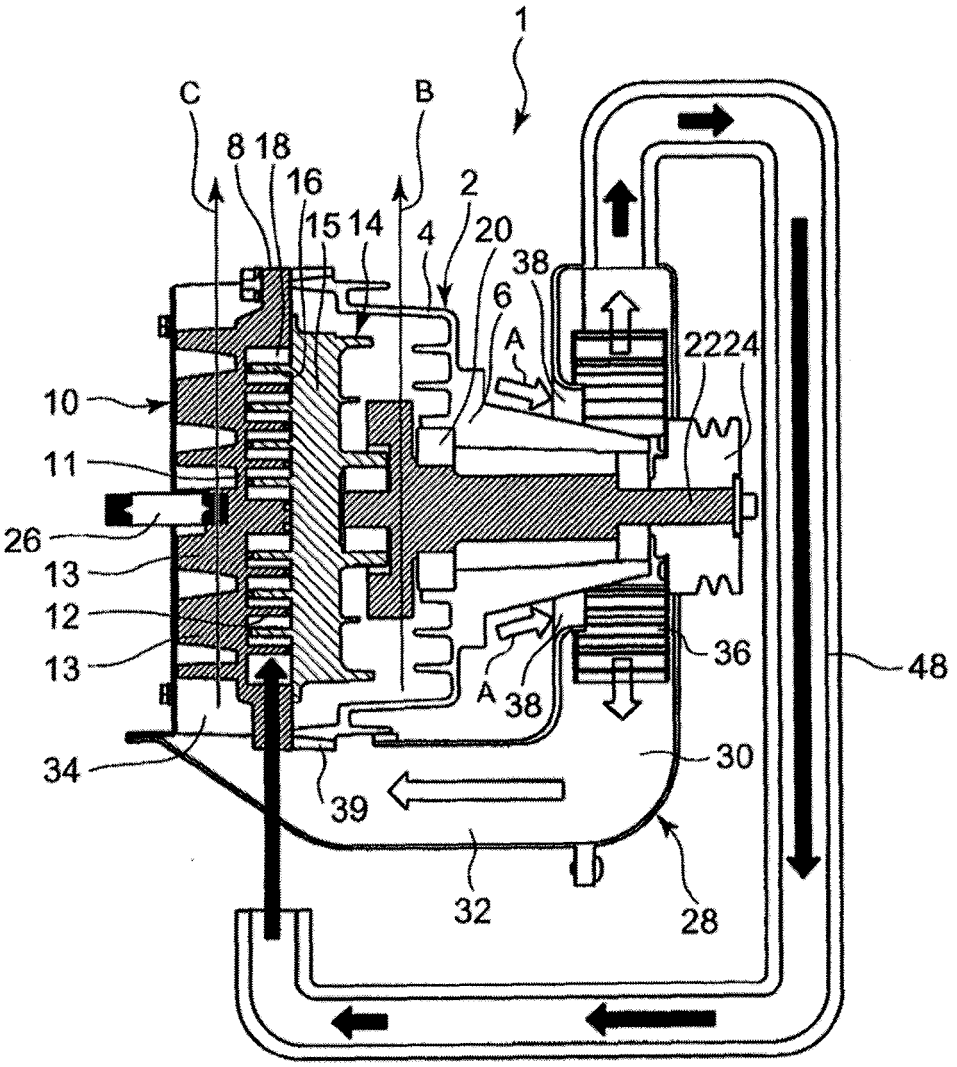
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Fig. 2

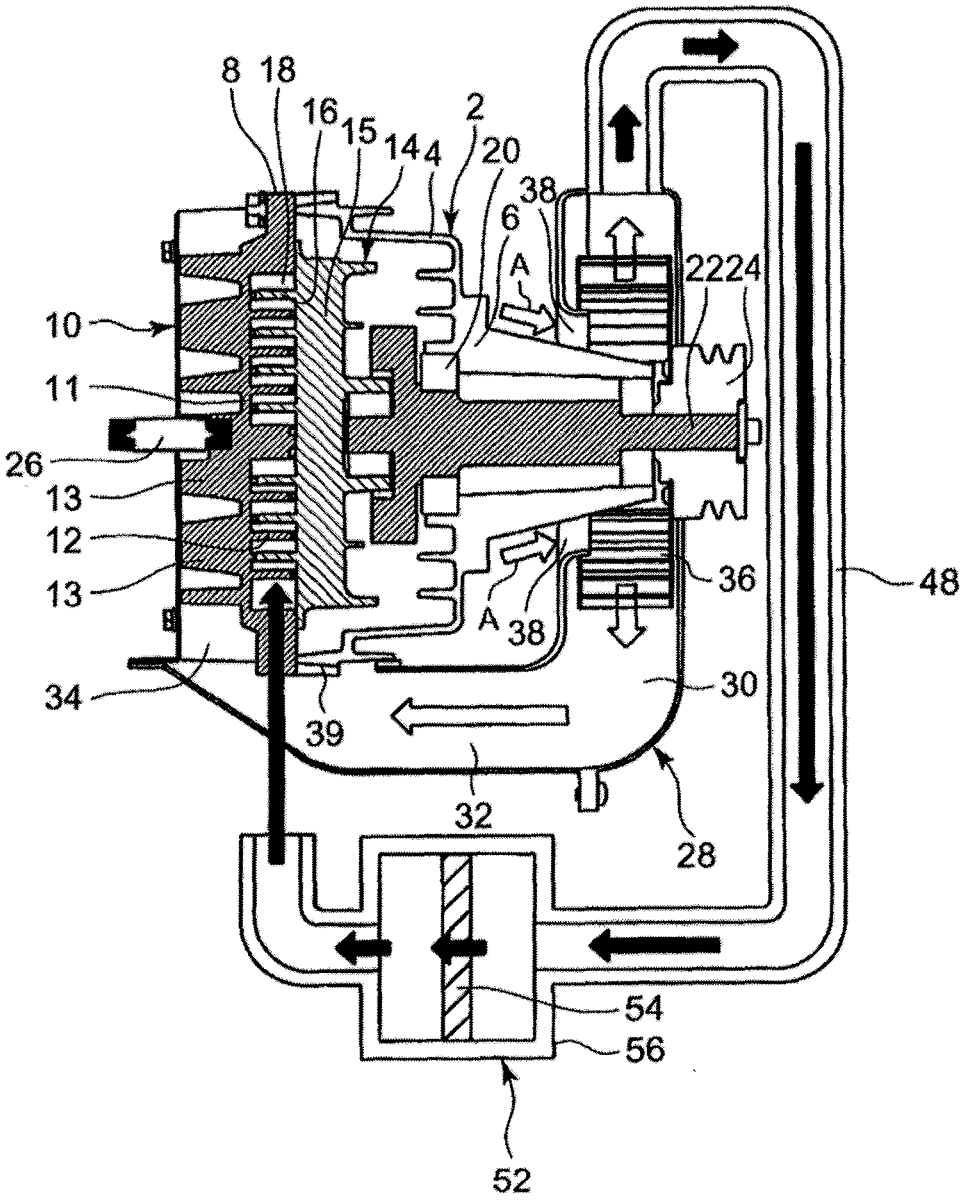
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Fig. 3

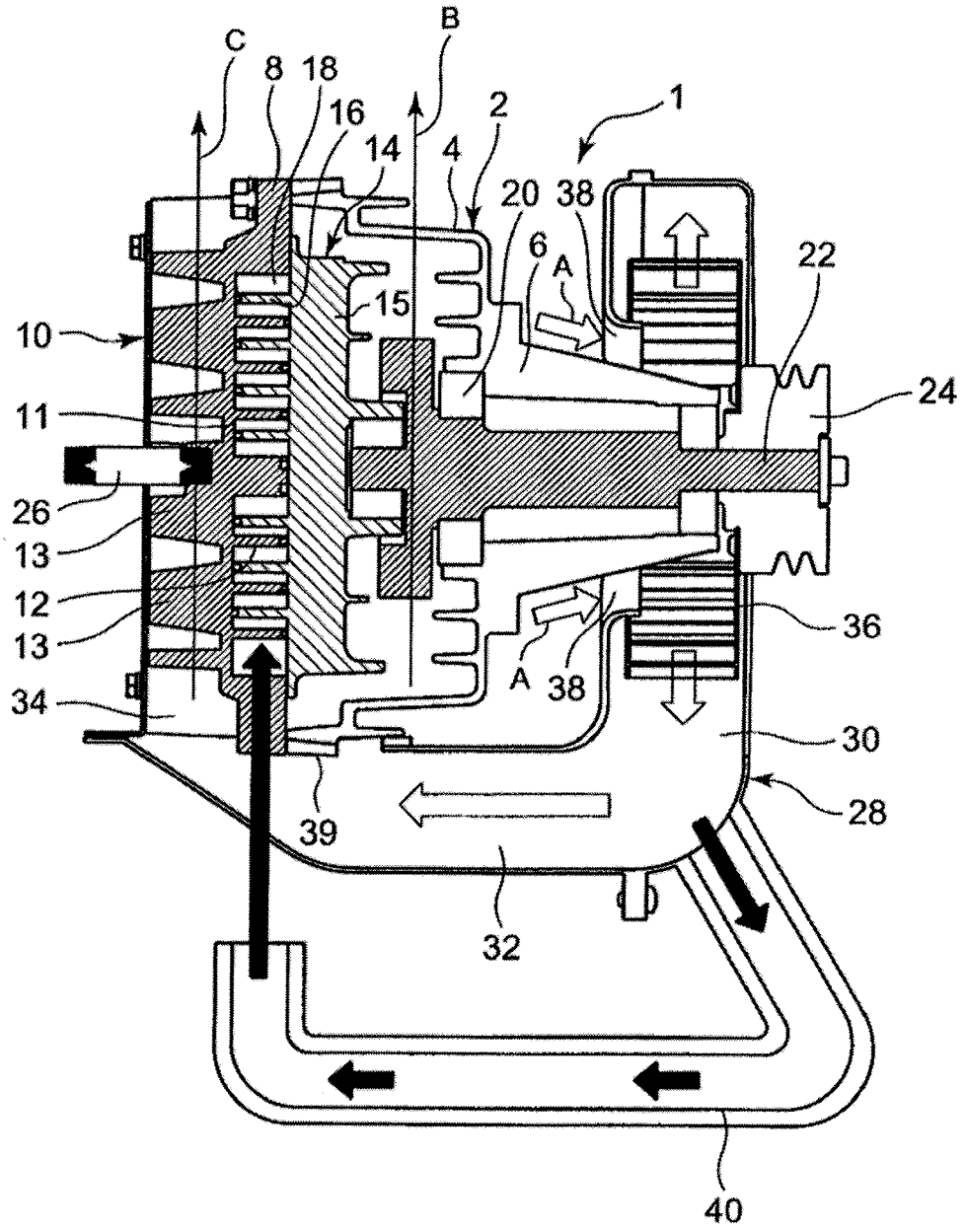
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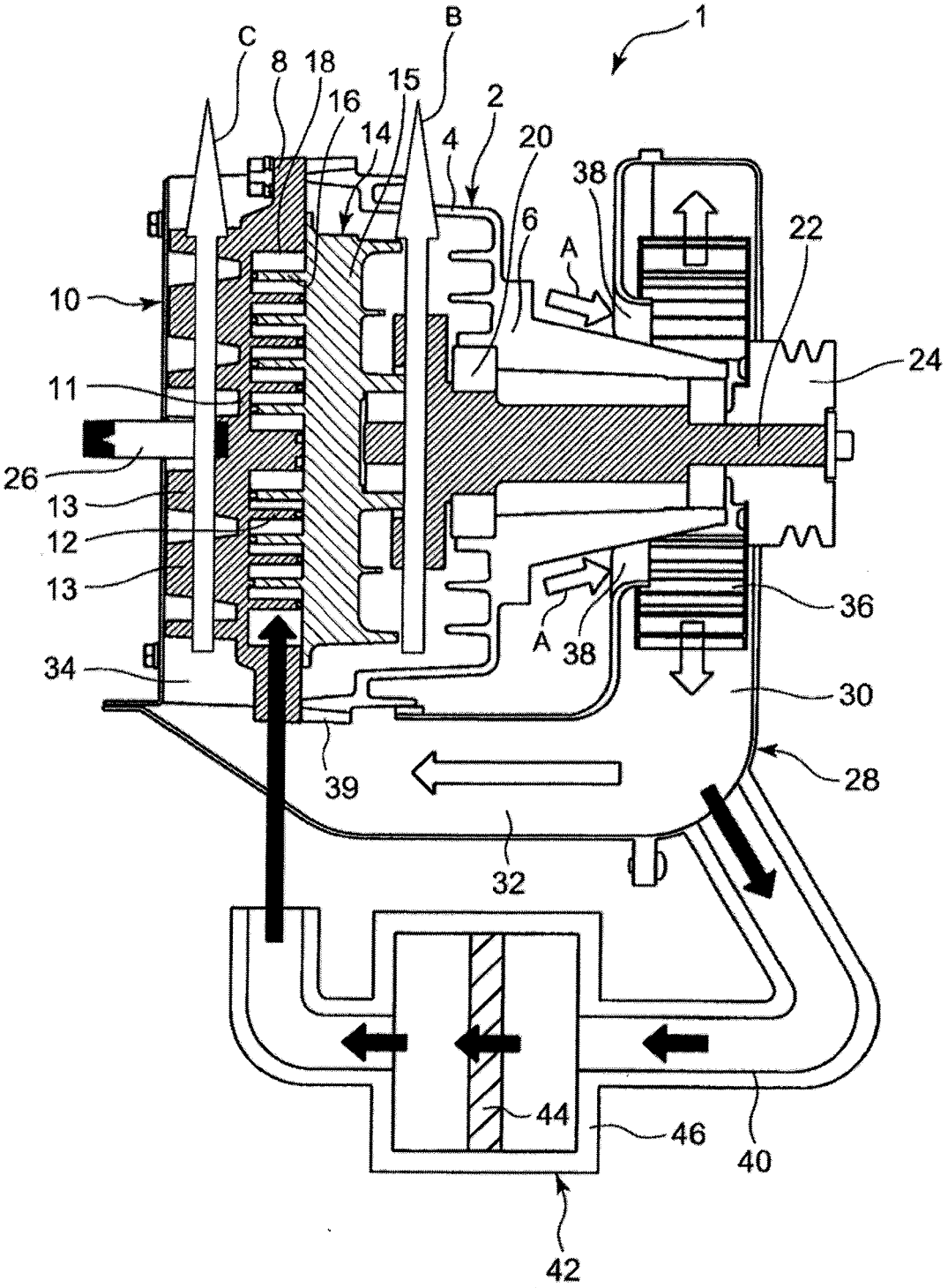
Fig. 4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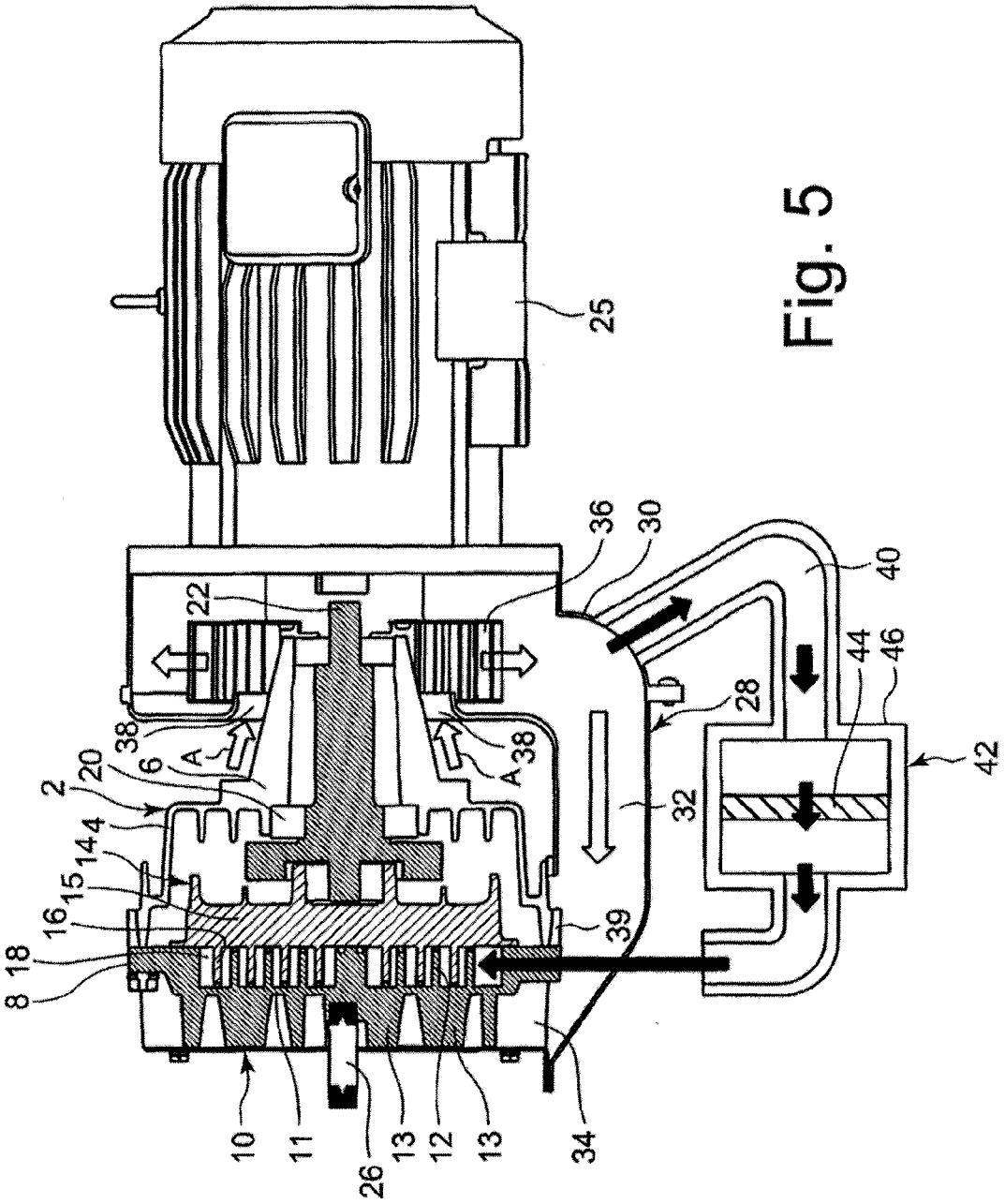
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Fig. 5

Fig. 6

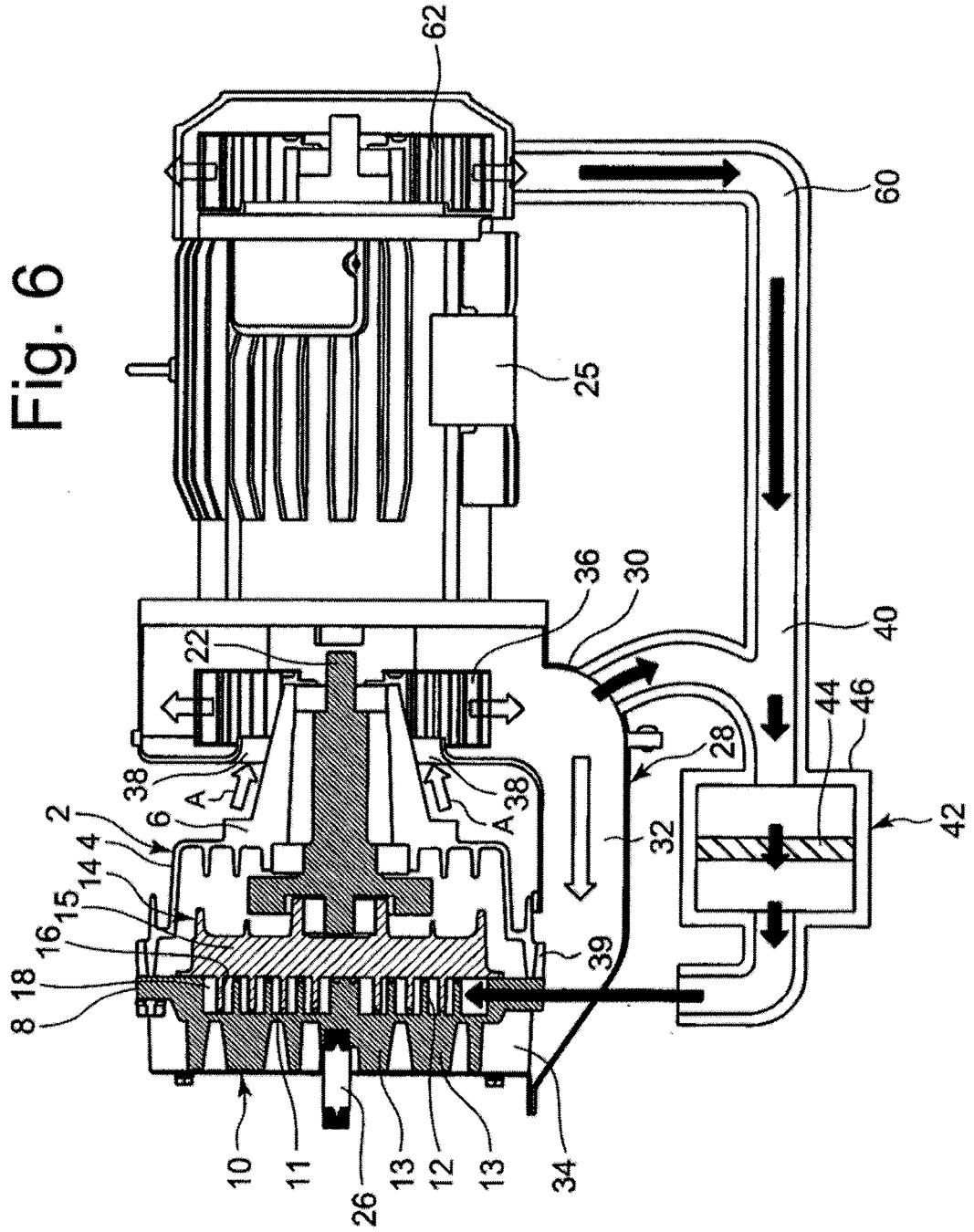
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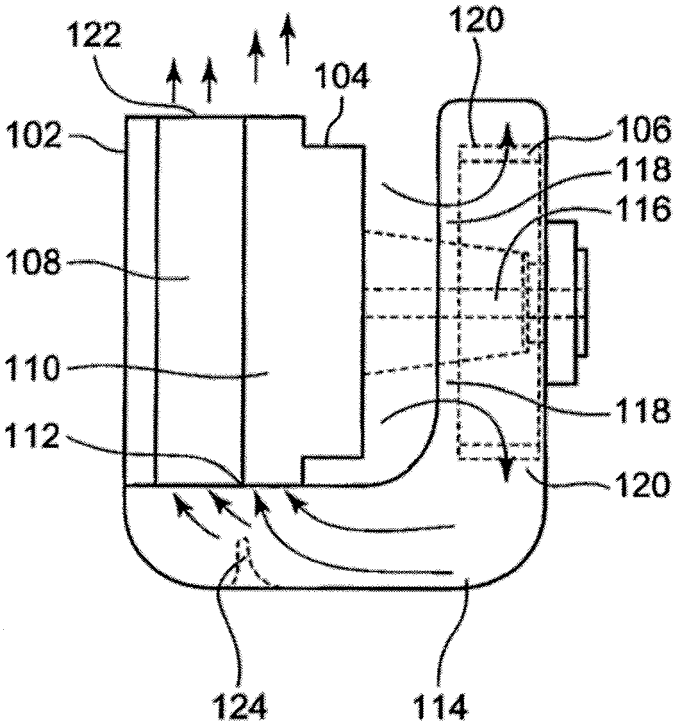
Fig. 7



Related Art

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Patent documents cited in the description

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