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(54) **AIR CONDITIONER HAVING A COMPRESSOR OIL STORAGE ASSEMBLY AND CONTROL METHOD THEREFOR**

**KLIMAAANLAGE MIT KOMPRESSORÖLAUFBEWAHRUNGSANORDNUNG UND
STEUERUNGSVERFAHREN DAFÜR**

**CLIMATISEUR AVEC UN ENSEMBLE DE STOCKAGE D'HUILE DE COMPRESSEUR ET SON
PROCÉDÉ DE COMMANDE**

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Description

TECHNICAL FIELD

[0001] The present invention relates to a field of air conditioner technology, and more particularly to an air conditioner comprising an oil storage assembly for a compressor and a control method thereof.

BACKGROUND

[0002] When a compressor of an air conditioner is shut down, with an attracting effect of refrigeration oil inside the compressor, refrigerant moves to an inside of the compressor, and mass of the refrigerant would accumulate in the compressor. When the compressor is restarted after long-term shutdown, the mass of the refrigerant accumulated inside the compressor will carry off the refrigeration oil inside the compressor during thermal cycling, resulting in oil shortage of the compressor.

[0003] CN200952856Y relates to an oil balance device of a multi-connected air conditioning unit, consisting of a plurality of lower pressure compressors. An oil storage tank is installed between an oil balancing hole of each compressor and an oil balance connecting pipe of the other compressor, the oil storage tank is connected with an air outlet side of the compressor through a first connecting pipe and connected with an air inlet side of the compressor through a second connecting pipe; the utility model utilizes the differential pressure between the air inlet side and the air outlet side of the compressor to obtain a higher differential pressure.

[0004] US2003/066302A1 relates to an oil amount detector, refrigeration apparatus and air conditioner. An oil holding tank is communicated to the case of the compressor. Part of the refrigerant discharged from the compressor is introduced into the oil holding tank so that the lubrication oil is allowed to flow out from the oil holding tank and the lubrication oil which flows out is allowed to return to the case. The presence of the lubrication oil is detected from a comparison between the temperature of the refrigerant introduced from the compressor to the oil holding tank and the temperature of the lubrication oil flowing out from the oil holding tank.

[0005] US5440897A relates to a closed loop oil service system operating in conjunction with an air conditioner or refrigerant compressor lubricated by lubricating oil contained within the compressor casing. The compressor includes a submerged oil drain port, a refrigerant inlet port and refrigerant outlet port. The closed loop oil service system utilizes a canister containing compressor lubricating oil and having a long stem first valve and a short stem second valve and, a refrigerant drum or a clear calibrated fluid injection device. The system also includes a pair of coupler hoses which fluidly and gaseously connect the canister valves and compressor ports. One coupler hose is connected between compressor oil drain port and canister first valve. The second coupler hose is con-

nected between compressor refrigerant outlet port and canister second valve.

[0006] EP1659350A1 relates to a multi-unit air conditioner including an outdoor unit comprising at least two compressors, a plurality of indoor units connected to the outdoor unit, a plurality of oil separators each connected to an associated one of the compressors to separate oil from a refrigerant discharged from the associated compressor, an oil storage for storing the oil separated from each oil separator, a plurality of oil supplying tubes each having one end connected to the oil storage, and the other end connected to an associated one of the compressors to supply the oil stored in the oil storage to the associated compressor, and adjusters each arranged at an associated one of the oil supplying tubes to adjust an amount of oil supplied from the oil storage to an associated one of the compressors in accordance with an oil storage state of the associated compressor.

SUMMARY

[0007] A main objective of the present invention is to provide an air conditioner and a control method, which may aim to solve a technical problem that the compressor is easy to be short of oil after long-term shutdown. In accordance with the present invention, there is provided an air conditioner as set out in claim 1 and a control method for an air conditioner as set out in claim 8. Other aspects of the invention can be found in the dependent claims. The air conditioner and the control method thereof provided by the present invention control the second electromagnetic valve to turn off and control the first electromagnetic valve to turn on when receiving the stop signal, to enable the refrigeration oil in the compressor to flow into the oil storage tank via the first pipeline, which controls the oil storage tank to store oil when the compressor is shut down; and control the first electromagnetic valve to turn off when the oil storage tank finishes storing oil during shutdown of the compressor; and control the second electromagnetic to turn on when receiving the power-on signal, to enable the refrigeration oil in the oil storage tank to flow into the compressor via the second pipeline, which controls the oil storage tank to drain oil. In this way, when the compressor is shut down, the refrigeration oil with a high concentration inside the oil storage tank may be stored in the oil storage tank in time, and when the compressor is restarted, the refrigeration oil with the high concentration inside the oil storage tank may be provided to the compressor in time, and thus an occurrence of the oil shortage of the compressor after a long-time shutdown is effectively avoided.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008]

Fig. 1 is a block diagram illustrating an oil storage assembly for a compressor according to the present

invention.

Fig. 2 is a flow chart illustrating a control method of an air conditioner according to a first embodiment of the present invention. Implementation of objectives, and functional features and advantages of the present invention will be further illustrated in combination with embodiments and with reference to drawings.

DETAILED DESCRIPTION

[0009] The present invention provides an air conditioner comprising an oil storage assembly for a compressor. Referring to Fig. 1, which is a block diagram illustrating the oil storage assembly for the compressor according to an embodiment of the present invention, the oil storage assembly for the compressor includes a compressor 100 and an oil storage tank 200. The compressor 100 is provided with an oil drain outlet 110. The oil storage tank 200 is provided with an oil inlet 210 and an oil outlet 220. The oil drain outlet 110 and the oil inlet 210 are connected with a first pipeline 300, and the first pipeline 300 is provided with a first electromagnetic valve 400. A second pipeline 500 is connected between the oil outlet 220 and a return air port 120 of the compressor 100, and the second pipeline 500 is provided with a second electromagnetic valve 600.

[0010] In this embodiment, the oil drain outlet 110 of the compressor 100, the first pipeline 300, the oil inlet 210 of the oil storage tank 200, the oil outlet 220 of the oil storage tank 200, the second pipeline 500 and the return air port 120 of the compressor 100 are sequentially connected, forming a circuit.

[0011] According to the invention, both the first electromagnetic valve 400 and the second electromagnetic valve 600 are connected with a controller of the air conditioner, wherein the controller is configured to control the first electromagnetic valve 400 and the second electromagnetic valve 600 to turn on and off.

[0012] According to the invention, the controller controls the second electromagnetic valve 600 to turn off and control the first electromagnetic valve 400 to turn on when receiving a stop signal, to enable the refrigeration oil in the compressor 100 to flow into the oil storage tank 200 via the first pipeline 300, so as to control the oil storage tank 200 to store oil when the compressor 100 is shut down.

[0013] When the oil storage tank 200 finishes storing oil during shutdown of the compressor 100, the controller turns off the first electromagnetic valve 400.

[0014] When receiving a power-on signal, the controller controls the second electromagnetic valve 600 to turn on, to enable the refrigeration oil in the oil storage tank 200 to flow into the compressor 100 via the second pipeline 500, so as to enable the oil storage tank 200 to drain oil.

[0015] When the controller detects that the compressor 100 is shut down, it is considered that the controller

receives the stop signal; or when the controller receives the shutdown signal sent by a user, it is considered that the controller receives the stop signal.

[0016] When the first electromagnetic valve 400 is controlled to turn on, the refrigeration oil in the compressor 100 can flow into the oil storage tank 200 via the pipeline 100 under the high pressure inside the compressor 100, such that the oil storage tank 200 can store oil when the compressor is shut down.

[0017] When the controller receives the stop signal, and controls the second electromagnetic valve 600 to turn off and controls the first electromagnetic valve 400 to turn on for a fifth preset time period, it can be considered that the oil storage tank 200 finishes storing oil when the compressor is shut down. Alternatively, an oil level detecting device may be arranged in the oil storage tank 200 for detecting an oil-storing volume of the oil storage tank 200, and when the oil level detecting device detects that the oil-storing volume of the oil storage tank 200 reaches a preset oil volume, it can be considered as finishing storing oil. The oil level detecting device may include, for example, a float provided in the oil storage tank 200 and a proximity switch provided on the top of the oil storage tank 200, and the proximity switch automatically switches on or off depending on the distance between the float and the proximity switch.

[0018] When the compressor 100 is restarted, the first electromagnetic valve 400 is in a turn-off state, and the second electromagnetic valve 600 is controlled to turn on. Under a negative pressure of the return air port 120 of the compressor 100, the refrigeration oil in the oil storage tank 200 may flow into the compressor 100 via the second pipeline 500, such that the refrigeration oil in the oil storage tank 200 returns to the inside of the compressor 100 again, and thus the occurrence of the oil shortage of the compressor 100 after long-term shutdown is avoided.

[0019] In embodiments, when the compressor 100 is steadily operating, oil temperature of the refrigeration oil at the bottom of the compressor 100 is relatively high, and concentration of the refrigeration oil may be relatively high. When the compressor 100 is shut down, the refrigeration oil with the relatively high concentration in the compressor 100 can flow into the oil storage tank 200 through the oil drain outlet 110 and the first pipeline 300. When the oil storage is completed, the first electromagnetic valve 400 is controlled to turn off, such that the stored refrigeration oil is sealed in the oil storage tank 200. When the compressor 100 is shut down for a long time, the refrigeration oil at the bottom of the compressor 100 is diluted with transferred refrigerant, and the concentration of the refrigeration oil in the oil storage tank 200 is higher at this time. When the compressor 100 is restarted, the second electromagnetic valve 600 is turned on, such that the refrigeration oil with the relatively high concentration in the oil storage tank 200 returns into the compressor 100 through the oil outlet 220 and the second pipeline 500, and thus the refrigeration oil with the higher

concentration is provided to the compressor 100 in time, which increases the concentration of the refrigeration oil at the bottom of the compressor 100, and effectively avoids the oil shortage in the compressor 100.

[0020] Further, a height of the oil drain outlet 110 relative to the bottom of the compressor 100 is less than half a height of the compressor 100. Since the refrigeration oil of the compressor 100 usually accumulates at the bottom of the compressor 100, the height of the oil drain outlet 110 cannot be too high, otherwise the refrigeration oil will not reach the oil drain outlet 110.

[0021] Further, in order to ensure a normal operation of a cylinder inside the compressor 100, the oil drain outlet 110 is higher than a top of the cylinder inside the compressor, such that the oil level of the refrigeration oil inside the compressor 100 is always higher than the cylinder, which ensures that the refrigeration oil always exists at the periphery of the cylinder, so that the cylinder can always work normally.

[0022] Further, a diameter of the first pipeline 300 is less than or equal to a diameter of the air outlet 130 of the compressor 100. Therefore, it ensures that the pressure at the air outlet 130 of the compressor 100 is not too small due to the exhaust action of the first pipeline 300, ensuring a heat exchange capacity of the air conditioner.

[0023] Further, a volume of the oil storage tank 200 is between 10% and 20% of a volume of the refrigeration oil of the air conditioner. Therefore, it not only ensures that the compressor 100 is not short of oil during the long-term shutdown, but also can ensure that the oil storage tank 200 does not affect the heat exchange capability of the compressor 100 too much after storing oil.

[0024] Further, a height of the oil inlet 210 of the oil storage tank 200 relative to the bottom of the oil storage tank 200 is greater than two-thirds of the height of the oil storage tank 200. Since the refrigeration oil flowing out through the oil drain outlet 110 of the compressor 100 may contain gaseous refrigerant, the oil inlet 210 of the oil storage tank 200 may be provided at a higher position of the oil storage tank 200, which is more advantageous for the refrigeration oil inside the compressor 100 to enter into the oil storage tank 200 via the first pipeline 300. Preferably, the oil outlet 220 is provided at the bottom of the oil storage tank 200, which is more advantageous for the refrigeration oil in the oil storage tank 200 to flow into the compressor 100.

[0025] The air conditioner according to the present invention includes a controller and an oil storage assembly for a compressor. With respect to a specific structure of the oil storage assembly for the compressor, reference can be made to the above embodiments.

[0026] The present invention provides a control method for an air conditioner. With respect to a structure of the air conditioner, reference may be made to the embodiments above, which will not be elaborated here. Referring to Fig. 2, which is a flow chart illustrating a control method of an air conditioner according to a first embod-

iment of the present invention, a control method of an air conditioner provided by the present invention includes the following steps. In block S10, when a stop signal is received, the second electromagnetic valve 600 is controlled to turn off, the first electromagnetic valve 400 is controlled to turn on, to enable the refrigeration oil in the compressor 100 to flow into the oil storage tank 200 via the first pipeline 300, so as to control the oil storage tank 200 to store oil when the compressor 100 is shut down.

[0027] When the controller detects that the compressor 100 is shut down, it is considered that the stop signal is received; or when the controller receives the shutdown signal sent by a user, it is considered that the stop signal is received. When the first electromagnetic valve 400 is controlled to turn on, the refrigeration oil in the compressor 100 flows into the oil storage tank 200 via the pipeline 100 under the high pressure inside the compressor 100, such that the oil storage tank 200 can store oil when the compressor is shut down.

[0028] In block S20, when the oil storage tank 200 finishes storing oil during shutdown of the compressor 100, the first electromagnetic valve 400 is controlled to turn off.

[0029] When the controller receives the stop signal, and controls the second electromagnetic valve 600 to turn off and controls the first electromagnetic valve 400 to turn on for a fifth preset time period, it can be considered that the oil storage tank 200 finishes storing oil when the controller is shut down. Alternatively, an oil level detecting device may be arranged in the oil storage tank 200 for detecting an oil-storing volume of the oil storage tank 200, and when the oil level detecting device detects that the oil-storing volume of the oil storage tank 200 reaches a preset oil volume, it can be considered as finishing storing oil. The oil level detecting device may include, for example, a float provided in the oil storage tank 200 and a proximity switch provided on the top of the oil storage tank 200, and the proximity switch automatically switches on or off depending on the distance between the float and the proximity switch.

[0030] In block S30, when a power-on signal is received, the second electromagnetic valve 600 is controlled to turn on, such that the refrigeration oil in the oil storage tank 200 flows into the compressor 100 via the second pipeline 500, to enable the oil storage tank 200 to drain oil.

[0031] When the compressor 100 is restarted, the first electromagnetic valve 400 is in a turn-off state, and the second electromagnetic valve 600 is controlled to turn on. Under a negative pressure of the return air port 120 of the compressor 100, the refrigeration oil in the oil storage tank 200 may flow into the compressor 100 via the second pipeline 500, such that the refrigeration oil in the oil storage tank 200 returns to the inside of the compressor 100 again, and thus the occurrence of the oil shortage of the compressor 100 after long-term shutdown is avoided.

[0032] Alternatively, when the oil storage tank 200 finishes draining oil, the second electromagnetic valve 600

is controlled to turn off. In this way, the oil storage tank 200 does not always communicate with the compressor 100, and further does not affect the heat exchange capacity of the compressor 100 during the normal operating process of the compressor 100. When the power-on signal is received, and when the second electromagnetic valve 600 is controlled to turn on for a fourth preset time period, it can be considered that the oil storage tank 200 finishes draining oil.

[0033] In embodiments, when the compressor 100 is steadily operating, oil temperature of the refrigeration oil at the bottom of the compressor 100 is relatively high, and concentration of the refrigeration oil may be relatively high. When the compressor 100 is shut down, the refrigeration oil with the relatively high concentration inside the compressor 100 can flow into the oil storage tank 200 through the oil drain outlet 110 and the first pipeline 300. When the oil storage is completed, the first electromagnetic valve 400 is controlled to turn off, such that the stored refrigeration oil is sealed in the oil storage tank 200. When the compressor 100 is shut down for a long time, the refrigeration oil at the bottom of the compressor 100 is diluted with transferred refrigerant, and the concentration of the refrigeration oil in the oil storage tank 200 is higher at this time. When the compressor 100 is restarted, the second electromagnetic valve 600 is turned on, such that the refrigeration oil with the relatively high concentration in the oil storage tank 200 returns into the compressor 100 through the oil outlet 220 and the second pipeline 500, and thus the refrigeration oil with the higher concentration is provided to the compressor 100 in time, which increases the concentration of the refrigeration oil at the bottom of the compressor 100, and effectively avoids the oil shortage in the compressor 100.

[0034] With the present invention, when the stop signal is received, the second electromagnetic valve 200 is controlled to turn off, and the first electromagnetic valve 400 is controlled to turn on, such that the refrigeration oil in the compressor 100 flows into the oil storage tank 200 via the first pipeline 300, which controls the oil storage tank 200 to store oil when the compressor 100 is shut down. Moreover, when the oil storage tank 200 finishes storing oil during shutdown of the compressor, the first electromagnetic valve 400 is turned off, and when the power-on signal is received, the second electromagnetic valve 600 is controlled to turn on, such that the refrigeration oil in the oil storage tank 200 flows into the compressor 100 via the second pipeline 500, which control the oil storage tank 200 to drain oil. Therefore, when the compressor 100 is shut down, the refrigeration oil with the relatively high concentration inside the compressor 100 may be stored in the oil storage tank 200 in time, and when the compressor 100 is restarted, the high-concentration refrigeration oil in the oil storage tank 200 can be provided to the compressor 100 in time, and thus the oil shortage of the compressor 100 after long-term shutdown is effectively avoided.

[0035] Further, in order to further improve the automat-

ic oil storage capacity of the oil storage tank 200, based on the first embodiment of a control method of an air conditioner in the present invention, the present invention further provides a second embodiment of the control method of the air conditioner, which further performs following operations before controlling the second electromagnetic valve 600 to turn off and controlling the first electromagnetic valve 400 to turn on to enable the oil storage tank 200 to store oil when the compressor is shut down:

controlling the first electromagnetic valve 400 to turn off and controlling the second electromagnetic valve 600 to turn on for a first preset time period, to enable the oil storage tank 200 to switch to a negative pressure state.

[0036] In embodiments, when the stop signal is received, before the second electromagnetic valve 600 is controlled to turn off and the first electromagnetic valve 400 is controlled to turn on, the first electromagnetic valve 400 is controlled to turn off and the second electromagnetic valve 600 is controlled to turn on for a first preset time period. Or, it is also possible to control the first electromagnetic valve 400 to turn off and control the second electromagnetic valve 600 to turn on for a first preset time period before receiving the stop signal, that is, during operating of the compressor 100.

[0037] The return air port 120 of the compressor 100 has a suction force during operating of the compressor 100, and the suction force of the return air port 120 keeps existing until the stop signal is received. Therefore, when the first electromagnetic valve 400 is turned off and the second electromagnetic valve 600 is turned on, a pressure in the oil storage tank 200 will gradually decrease under the suction force of the return air port 120 of the compressor 100, reaching a low pressure state, which can be referred as a negative pressure state. Therefore, when the oil storage tank 200 is controlled to store oil, the refrigeration oil in the compressor 100 is easy to flow into the oil storage tank 200 in the negative pressure state.

[0038] Further, based on the first or the second embodiment of the control method of the air conditioner in the present invention, the present invention further provides a third embodiment of the control method of the air conditioner, which further includes:

calculating a discharge superheat degree of the compressor 100 when the compressor 100 is operating;

when the discharge superheat degree is greater than a preset threshold for a second preset time period, controlling the second electromagnetic valve 600 to turn off and controlling the first electromagnetic valve 400 to turn on, to enable the refrigeration oil in the compressor 100 to flow into the oil storage tank 200 via the first pipeline 300, such that the oil storage tank 200 is controlled to store oil when the compressor 100 is operating; and

when the oil storage tank 200 finishes storing oil dur-

ing operating of the compressor 100, turning off the first electromagnetic valve 400.

[0039] In embodiments, the discharge superheat degree is a difference between a discharge temperature and a discharge saturation temperature of the compressor 100. The discharge superheat degree is an existing concept, and will not be described in detail here.

[0040] It is to be understood that, when the compressor is operating, and the discharge superheat degree does not continue to be greater than a preset threshold for a second preset time period, the first electromagnetic valve 400 is always in the turn-off state. At this time, optionally, the second electromagnetic valve 600 is also in the turn-off state. During operating of the compressor 100, the discharge superheat degree of the compressor 100 may be detected in real time, and it is determined whether the discharge superheat degree is greater than the preset threshold for the second preset time period.

[0041] The preset threshold may be between 5°C and 15°C. Alternatively, it can be set to 10°C. Alternatively, the second preset duration may be about 5 minutes.

[0042] When the second electromagnetic valve 600 is controlled to turn off and the first electromagnetic valve 400 is controlled to turn on for a sixth preset time period after the discharge superheat degree continues to be greater than the preset threshold for the second preset time period, it can be considered that the oil storage tank 200 finishes storing oil during operating of the compressor 100. Or, when the oil level detecting device detects that the oil-storing volume of the oil storage tank 200 reaches the preset oil volume, it can be considered that the oil storage tank 200 finishes storing oil during operating of the compressor 100.

[0043] In embodiments, when the discharge superheat degree continues to be at a high level for a long time during the operating of the compressor 100, concentration of the refrigeration oil in the compressor 100 is relatively high, and excess refrigeration oil in the compressor 100 may be stored, which further increases the concentration of the oil storage in the oil storage tank 200, and effectively avoids the shortage of oil when the compressor 100 is shut down.

[0044] Further, in order to further improve the automatic oil storage capacity of the oil storage tank 200, based on the third embodiment of the control method of the air conditioner in the present disclosure, the present disclosure further provides a forth embodiment of a control method of an air conditioner, which further includes following operations before controlling the second electromagnetic valve 600 to turn off and controlling the first electromagnetic valve 400 to turn on to enable the oil storage tank 200 to store oil during operating of the compressor 100:

controlling the first electromagnetic valve 400 to turn off and controlling the second electromagnetic valve 600 to turn on for a third preset time period, to enable the oil storage tank 200 to switch to a negative pressure state.

[0045] In embodiments, when the discharge superheat degree continues to be greater than a preset threshold for a second preset time period, it is possible to first control the first electromagnetic valve 400 to turn off and control the second electromagnetic valve 600 to turn on for the third time period before controlling the second electromagnetic valve 600 to turn off and controlling the first electromagnetic valve 400 to turn on. Or, it is also possible to control the first electromagnetic valve 400 to turn off and control the second electromagnetic valve 600 to turn on for the third time period after the compressor 100 is on or during operating of the compressor 100, such that when the discharge superheat degree continues to be greater than the preset threshold for the second preset time period, the oil storage tank 200 can be switched to a negative state in advance.

[0046] The return air port 120 of the compressor 100 has a suction force during operating of the compressor 100, and the suction force of the return air port 120 keeps existing until the stop signal is received. Therefore, when the first electromagnetic valve 400 is turned off and the second electromagnetic valve 600 is turned on, a pressure in the oil storage tank 200 will gradually decrease under the suction force of the return air port 120 of the compressor 100, reaching a low pressure state, which can be referred as a negative pressure state. Therefore, when the oil storage tank 200 is controlled to store oil, the refrigeration oil in the compressor 100 is easy to flow into the oil storage tank 200 in the negative pressure state.

[0047] According to the present invention, there is provided a non-transitory computer-readable storage medium as defined in claim 13.

[0048] The sequence numbers of the foregoing embodiments of the present invention are merely for description and do not represent the advantages and disadvantages of the embodiments.

[0049] Through the above description of the embodiments, those skilled in the art can clearly understand that the above embodiment methods can be implemented by means of software plus a necessary general hardware platform, and of course, can also be achieved through hardware. But in many cases the former is a better implementation. Based on this understanding, the technology solution of the present invention essentially or in a part contributing to a related technology may be embodied in the form of a software product, the computer software product is stored in a memory medium (it may be ROM/RAM, a magnetic disk, or an optical disk), several instructions are included to enable a terminal device (it may be a telephone, a computer, a server, an air conditioner, or a network device, etc.) to perform the methods described in the various embodiments of the present invention.

[0050] In addition, the description of "first", "second" and the like in the present disclosure is only for description purpose, it cannot be understood as indicating or implying its relative importance or implying the number

of indicated technology features. Thus, features defined as "first", "second" may explicitly or implicitly include at least one of the features.

Claims

1. An air conditioner comprising an oil storage assembly for a compressor, comprising a compressor (100) and an oil storage tank (200), wherein the compressor (100) is provided with an oil drain outlet (110), the oil storage tank (200) is provided with an oil inlet (210) and an oil outlet (220), the oil inlet (210) and the oil drain outlet (110) are connected with a first pipeline (300), and the first pipeline (300) is provided with a first electromagnetic valve (400); a second pipeline (500) is connected between the oil outlet (220) and a return air port (120) of the compressor (100), and the second pipeline (500) is provided with a second electromagnetic valve (600),
 wherein the air conditioner further comprises a controller,
 wherein both the first electromagnetic valve (400) and the second electromagnetic valve (600) are connected with said controller,
 wherein, the controller is configured to control the second electromagnetic valve (600) to turn off and control the first electromagnetic valve (400) to turn on when receiving a stop signal, to enable the oil storage tank (200) to store oil when the compressor is shut down;
 the controller is configured to control the first electromagnetic valve (400) to turn off when the oil storage tank (200) finishes storing oil during shutdown of the compressor; and
 the controller is configured to control the second electromagnetic valve (600) to turn on to enable the oil storage tank (200) to drain oil when receiving a power-on signal.
2. The air conditioner according to claim 1, wherein a height of the oil drain outlet (110) relative to a bottom of the compressor (100) is less than half a height of the compressor (100).
3. The air conditioner according to claim 2, wherein the oil drain outlet (110) is higher than a top of a cylinder inside the compressor.
4. The air conditioner according to claim 1, wherein a diameter of the first pipeline (300) is less than or equal to a diameter of an air outlet of the compressor.
5. The air conditioner according to claim 1, wherein before controlling the second electromagnetic valve (600) to turn off and controlling the first electromagnetic valve (400) to turn on to enable the oil storage tank (200) to store oil when the compressor is shut down, the controller is further configured to control the first electromagnetic valve (400) to turn off and control the second electromagnetic valve (600) to turn on for a first preset time period, to enable the oil storage tank (200) to switch to a negative pressure state.
6. The air conditioner according to claim 1, wherein after controlling the second electromagnetic valve (600) to turn on when receiving the power-on signal, the controller is further configured to turn off the second electromagnetic valve (600) when the oil storage tank finishes draining oil.
7. The air conditioner according to claim 1, wherein the controller is further configured to calculate a discharge superheat degree of the compressor when the compressor is operating, and to control the second electromagnetic valve (600) to turn off and control the first electromagnetic valve (400) to turn on when the discharge superheat degree continues to be greater than a preset threshold for a second preset time period, to enable the oil storage tank (200) to store oil when the compressor is operating; the controller is further configured to turn off the first electromagnetic valve (400), when the oil storage tank (200) finishes storing oil during operating of the compressor.
8. A control method of an air conditioner according to claim 1, comprising:
 controlling the second electromagnetic valve (600) to turn off and controlling the first electromagnetic valve (400) to turn on when receiving a stop signal, to enable the oil storage tank (200) to store oil when the compressor is shut down; turning off the first electromagnetic valve (400) when the oil storage tank (200) finishes storing oil during shutdown of the compressor; controlling the second electromagnetic valve (600) to turn on to enable the oil storage tank (200) to drain oil, when receiving a power-on signal.
9. The control method according to claim 8, wherein before controlling the second electromagnetic valve (600) to turn off and controlling the first electromagnetic valve (400) to turn on to enable the oil storage tank (200) to store oil when the compressor is shut down, the control method further comprises: controlling the first electromagnetic valve (400) to turn off and controlling the second electromagnetic valve (600) to turn on for a first preset time period, to enable the oil storage tank (200) to switch to a negative pressure state.

10. The control method according to claim 8, wherein after controlling the second electromagnetic valve (600) to turn on when receiving the power-on signal, the control method further comprises: turning off the second electromagnetic valve (600) when the oil storage tank (200) finishes draining oil. 5
11. The control method according to any of claims 8-10, further comprising: 10
- calculating a discharge superheat degree of the compressor when the compressor is operating; controlling the second electromagnetic valve (600) to turn off and controlling the first electromagnetic valve (400) to turn on when the discharge superheat degree is greater than a preset threshold for a second preset time period, to enable the oil storage tank (200) to store oil when the compressor is operating; 15
- turning off the first electromagnetic valve (400), when the oil storage tank finishes storing oil during operating of the compressor. 20
12. The control method according to claim 11, wherein before controlling the second electromagnetic valve (600) to turn off and controlling the first electromagnetic valve (400) to be turn on to enable the oil storage tank (200) to store oil when the compressor is operating, the control method further comprises: controlling the first electromagnetic valve (400) to turn off and controlling the second electromagnetic valve (600) to turn on for a third preset time period, to enable the oil storage tank (200) to switch to a negative pressure state. 25 30
13. A non-transitory computer-readable storage medium, stored with computer programs, wherein the programs are configured to realize the control method according to any of claims 8-12 when executed by the controller of the air conditioner according to claim 1. 35 40

Patentansprüche

1. Klimaanlage, umfassend eine Ölspeicheranordnung für einen Verdichter, umfassend einen Verdichter (100) und einen Ölspeicherbehälter (200), wobei der Verdichter (100) mit einem Ölablassauslass (110) versehen ist, der Ölspeicherbehälter (200) mit einem Öleinlass (210) und einem Ölauslass (220) versehen ist, der Öleinlass (210) und der Ölablassauslass (110) mit einer ersten Rohrleitung (300) gekoppelt sind und die erste Rohrleitung (300) mit einem ersten Elektromagnetventil (400) versehen ist; eine zweite Rohrleitung (500) zwischen dem Ölauslass (220) und einer Rückluftöffnung (120) des Verdichters (100) gekoppelt ist und die zweite Rohrleitung (500) mit 45 50 55

einem zweiten Elektromagnetventil (600) versehen ist,

wobei die Klimaanlage ferner eine Steuerung umfasst, wobei sowohl das erste Elektromagnetventil (400) als auch das zweite Elektromagnetventil (600) mit der Steuerung gekoppelt sind, wobei die Steuerung dazu konfiguriert ist, das zweite Elektromagnetventil (600) dazu zu steuern, auszuschalten, und das erste Elektromagnetventil (400) dazu zu steuern, einzuschalten, wenn ein Stoppsignal empfangen wird, um zu ermöglichen, dass der Ölspeicherbehälter (200) Öl speichert, wenn der Verdichter abgeschaltet wird; die Steuerung dazu konfiguriert ist, das erste Elektromagnetventil (400) dazu zu steuern, auszuschalten, wenn der Ölspeicherbehälter (200) das Speichern von Öl während der Abschaltung des Verdichters abgeschlossen hat; und die Steuerung dazu konfiguriert ist, das zweite Elektromagnetventil (600) dazu zu steuern, einzuschalten, um zu ermöglichen, dass der Ölspeicherbehälter (200) Öl ablässt, wenn ein Strom-Ein-Signal empfangen wird.

2. Klimaanlage nach Anspruch 1, wobei eine Höhe des Ölablassauslasses (110) relativ zu einer Unterseite des Verdichters (100) weniger als die Hälfte einer Höhe des Verdichters (100) beträgt.
3. Klimaanlage nach Anspruch 2, wobei der Ölablassauslass (110) höher als eine Oberseite eines Zylinders in dem Verdichter ist. 35
4. Klimaanlage nach Anspruch 1, wobei ein Durchmesser der ersten Rohrleitung (300) kleiner oder gleich einem Durchmesser eines Luftauslasses des Verdichters ist.
5. Klimaanlage nach Anspruch 1, wobei vor dem Steuern des zweiten Elektromagnetventils (600) dazu, auszuschalten, und dem Steuern des ersten Elektromagnetventils (400), einzuschalten, um zu ermöglichen, dass der Ölspeicherbehälter (200) Öl speichert, wenn der Verdichter abgeschaltet wird, die Steuerung ferner dazu konfiguriert ist, das erste Elektromagnetventil (400) dazu zu steuern, für einen ersten vorgegebenen Zeitraum auszuschalten, und das zweite Elektromagnetventil (600) dazu zu steuern, für den ersten vorgegebenen Zeitraum einzuschalten, um zu ermöglichen, dass der Ölspeicherbehälter (200) in einen Unterdruckzustand wechselt. 45 50 55
6. Klimaanlage nach Anspruch 1, wobei nach dem Steuern des zweiten Elektromagnetventils (600) dazu, einzuschalten, wenn das Strom-Ein-Signal emp-

fangen wird, die Steuerung ferner dazu konfiguriert ist, das zweite Elektromagnetventil (600) auszuschalten, wenn der Ölspeicherbehälter das Ablassen von Öl abgeschlossen hat.

7. Klimaanlage nach Anspruch 1, wobei die Steuerung ferner dazu konfiguriert ist, einen Austrittsüberhitzungsgrad des Verdichters zu berechnen, wenn der Verdichter arbeitet, und das zweite Elektromagnetventil (600) dazu zu steuern, auszuschalten, und das erste Elektromagnetventil (400) dazu zu steuern, einzuschalten, wenn der Austrittsüberhitzungsgrad für einen zweiten vorgegebenen Zeitraum weiterhin größer als ein vorgegebener Grenzwert ist, um zu ermöglichen, dass der Ölspeicherbehälter (200) Öl speichert, wenn der Verdichter arbeitet; die Steuerung ferner dazu konfiguriert ist, das erste Elektromagnetventil (400) auszuschalten, wenn der Ölspeicherbehälter (200) das Speichern von Öl während des Betriebs des Verdichters abgeschlossen hat.

8. Steuerverfahren einer Klimaanlage nach Anspruch 1, umfassend:

Steuern des zweiten Elektromagnetventils (600) dazu, auszuschalten, und Steuern des ersten Elektromagnetventils (600) dazu, einzuschalten, wenn ein Stoppsignal empfangen wird, um zu ermöglichen, dass der Ölspeicherbehälter (200) Öl speichert, wenn der Verdichter abgeschaltet ist;

Ausschalten des ersten Elektromagnetventils (400), wenn der Ölspeicherbehälter (200) das Speichern von Öl während der Abschaltung des Verdichters abgeschlossen hat;

Steuern des zweiten Elektromagnetventils (600) dazu, einzuschalten, um zu ermöglichen, dass der Ölspeicherbehälter (200) Öl ablässt, wenn ein Strom-Ein-Signal empfangen wird.

9. Steuerverfahren nach Anspruch 8, wobei vor dem Steuern des zweiten Elektromagnetventils (600) dazu, auszuschalten, und dem Steuern des ersten Elektromagnetventils (400) dazu, einzuschalten, um zu ermöglichen, dass der Ölspeicherbehälter (200) Öl speichert, wenn der Verdichter abgeschaltet ist, das Steuerverfahren ferner Folgendes umfasst: Steuern des ersten Elektromagnetventils (400) dazu, für einen ersten vorgegebenen Zeitraum auszuschalten, und Steuern des zweiten Elektromagnetventils (600) dazu, für den ersten vorgegebenen Zeitraum einzuschalten, um zu ermöglichen, dass der Ölspeicherbehälter (200) in einen Unterdruckzustand wechselt.

10. Steuerverfahren nach Anspruch 8, wobei nach dem Steuern des zweiten Elektromagnetventils (600) da-

zu, einzuschalten, wenn das Strom-Ein-Signal empfangen wird, das Steuerverfahren Folgendes umfasst:

Ausschalten des zweiten Elektromagnetventils (600), wenn der Ölspeicherbehälter (200) das Ablassen von Öl abgeschlossen hat.

11. Steuerverfahren nach einem der Ansprüche 8-10, ferner umfassend:

Berechnen eines Austrittsüberhitzungsgrads des Verdichters, wenn der Verdichter arbeitet; Steuern des zweiten Elektromagnetventils (600) dazu, auszuschalten und Steuern des ersten Elektromagnetventils (400) dazu, einzuschalten, wenn der Austrittsüberhitzungsgrad für einen zweiten vorgegebenen Zeitraum höher als ein vorgegebener Grenzwert ist, um zu ermöglichen, dass der Ölspeicherbehälter (200) Öl speichert, wenn der Verdichter arbeitet; Ausschalten des ersten Elektromagnetventils (400), wenn der Ölspeicherbehälter das Speichern von Öl während des Betriebs des Verdichters abgeschlossen hat.

12. Steuerverfahren nach Anspruch 11, wobei vor dem Steuern des zweiten Elektromagnetventils (600) dazu, auszuschalten, und dem Steuern des ersten Elektromagnetventils (400) dazu, einzuschalten, um zu ermöglichen, dass der Ölspeicherbehälter (200) Öl speichert, wenn der Verdichter arbeitet, das Steuerverfahren ferner Folgendes umfasst: Steuern des ersten Elektromagnetventils (400) dazu, für einen dritten vorgegebenen Zeitraum auszuschalten, und Steuern des zweiten Elektromagnetventils (600) dazu, für den dritten vorgegebenen Zeitraum einzuschalten, um zu ermöglichen, dass der Ölspeicherbehälter (200) in einen Unterdruckzustand wechselt.

13. Nichtflüchtiges computerlesbares Speichermedium, auf dem Computerprogramme gespeichert sind, wobei die Programme dazu konfiguriert sind, das Steuerverfahren nach einem der Ansprüche 8-12 umzusetzen, wenn sie von der Steuerung der Klimaanlage nach Anspruch 1 ausgeführt werden.

Revendications

1. Climatiseur comprenant un ensemble de stockage d'huile pour un compresseur, comprenant un compresseur (100) et un réservoir de stockage d'huile (200), où le compresseur (100) est muni d'une sortie de vidange d'huile (110), le réservoir de stockage d'huile (200) est muni d'une entrée d'huile (210) et d'une sortie d'huile (220), l'entrée d'huile (210) et la sortie de vidange d'huile (110) sont reliées à une

première canalisation (300), et la première canalisation (300) est munie d'une première électrovanne (400) ; une deuxième canalisation (500) est reliée entre la sortie d'huile (220) et un orifice de retour d'air (120) du compresseur (100), et la deuxième canalisation (500) est pourvue d'une deuxième électrovanne (600),

où le climatiseur comprend en outre un dispositif de commande,

où la première électrovanne (400) et la deuxième électrovanne (600) sont toutes deux reliées audit dispositif de commande,

où le dispositif de commande est configuré pour commander la deuxième électrovanne (600) pour qu'elle se ferme et pour commander la première électrovanne (400) pour qu'elle s'ouvre lors de la réception d'un signal d'arrêt, pour permettre au réservoir de stockage d'huile (200) de stocker de l'huile lorsque le compresseur est arrêté ;

le dispositif de commande est configuré pour commander la première électrovanne (400) pour qu'elle se ferme lorsque le réservoir de stockage d'huile (200) finit de stocker de l'huile pendant l'arrêt du compresseur ; et

le dispositif de commande est configuré pour commander la deuxième électrovanne (600) pour qu'elle s'ouvre pour permettre au réservoir de stockage d'huile (200) de vidanger l'huile lors de la réception d'un signal de mise en marche.

2. Climatiseur selon la revendication 1, où une hauteur de la sortie de vidange d'huile (110) par rapport à une partie inférieure du compresseur (100) est inférieure à la moitié d'une hauteur du compresseur (100).
3. Climatiseur selon la revendication 2, où la sortie de vidange d'huile (110) est plus haute qu'une partie supérieure d'un cylindre à l'intérieur du compresseur.
4. Climatiseur selon la revendication 1, où un diamètre de la première canalisation (300) est inférieur ou égal à un diamètre d'une sortie d'air du compresseur.
5. Climatiseur selon la revendication 1, où avant de commander la deuxième électrovanne (600) pour qu'elle se ferme et de commander la première électrovanne (400) pour qu'elle s'ouvre pour permettre au réservoir de stockage d'huile (200) de stocker de l'huile lorsque le compresseur est arrêté, le dispositif de commande est en outre configuré pour commander la première électrovanne (400) pour qu'elle se ferme et commander la deuxième électrovanne (600) pour qu'elle s'ouvre pendant une première période de temps prédéfinie, pour permettre au réservoir

de stockage d'huile (200) de passer à un état de pression négative.

6. Climatiseur selon la revendication 1, où après avoir commandé la deuxième électrovanne (600) pour qu'elle s'ouvre lors de la réception du signal de mise en marche, le dispositif de commande est en outre configuré pour fermer la deuxième électrovanne (600) lorsque le réservoir de stockage d'huile finit de vidanger l'huile.

7. Climatiseur selon la revendication 1, où le dispositif de commande est en outre configuré pour calculer un degré de surchauffe de décharge du compresseur lorsque le compresseur fonctionne, et pour commander la deuxième électrovanne (600) pour qu'elle se ferme et commander la première électrovanne (400) pour qu'elle s'ouvre lorsque le degré de surchauffe de décharge continue d'être supérieur à un seuil prédéfini pendant une deuxième période de temps prédéfinie, pour permettre au réservoir de stockage d'huile (200) de stocker de l'huile lorsque le compresseur fonctionne ; le dispositif de commande est en outre configuré pour fermer la première électrovanne (400), lorsque le réservoir de stockage d'huile (200) finit de stocker de l'huile pendant le fonctionnement du compresseur.

8. Procédé de commande d'un climatiseur selon la revendication 1, comprenant :

la commande de la deuxième électrovanne (600) pour qu'elle se ferme et la commande de la première électrovanne (400) pour qu'elle s'ouvre lors de la réception d'un signal d'arrêt, pour permettre au réservoir de stockage d'huile (200) de stocker de l'huile lorsque le compresseur est arrêté ;

la fermeture de la première électrovanne (400) lorsque le réservoir de stockage d'huile (200) finit de stocker de l'huile pendant l'arrêt du compresseur ;

la commande de la deuxième électrovanne (600) pour qu'elle s'ouvre pour permettre au réservoir de stockage d'huile (200) de vidanger l'huile, lors de la réception d'un signal de mise en marche.

9. Procédé de commande selon la revendication 8, où avant de commander la deuxième électrovanne (600) pour qu'elle se ferme et de commander la première électrovanne (400) pour qu'elle s'ouvre pour permettre au réservoir de stockage d'huile (200) de stocker de l'huile lorsque le compresseur est arrêté, le procédé de commande comprend en outre : la commande de la première électrovanne (400) pour qu'elle se ferme et la commande de la deuxième

électrovanne (600) pour qu'elle s'ouvre pendant une première période de temps prédéfinie, pour permettre au réservoir de stockage d'huile (200) de passer à un état de pression négative.

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10. Procédé de commande selon la revendication 8, où après avoir commandé la deuxième électrovanne (600) pour qu'elle s'ouvre lors de la réception du signal de mise en marche, le procédé de commande comprend en outre :
la fermeture de la deuxième électrovanne (600) lorsque le réservoir de stockage d'huile (200) finit de vidanger l'huile.

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11. Procédé de commande selon l'une quelconque des revendications 8 à 10, comprenant en outre :

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le calcul d'un degré de surchauffe de décharge du compresseur lorsque le compresseur fonctionne ;

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la commande de la deuxième électrovanne (600) pour qu'elle se ferme et la commande de la première électrovanne (400) pour qu'elle s'ouvre lorsque le degré de surchauffe de décharge est supérieur à un seuil prédéfini pendant une deuxième période de temps prédéfinie, pour permettre au réservoir de stockage d'huile (200) de stocker de l'huile lorsque le compresseur fonctionne ;

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la fermeture de la première électrovanne (400), lorsque le réservoir de stockage d'huile finit de stocker de l'huile pendant le fonctionnement du compresseur.

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12. Procédé de commande selon la revendication 11, où avant de commander la deuxième électrovanne (600) pour qu'elle se ferme et de commander la première électrovanne (400) pour qu'elle s'ouvre pour permettre au réservoir de stockage d'huile (200) de stocker de l'huile lorsque le compresseur fonctionne, le procédé de commande comprend en outre :
la commande de la première électrovanne (400) pour qu'elle se ferme et la commande de la deuxième électrovanne (600) pour qu'elle s'ouvre pendant une troisième période de temps prédéfinie, pour permettre au réservoir de stockage d'huile (200) de passer à un état de pression négative.

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13. Support de stockage lisible par ordinateur non transitoire, stocké avec des programmes informatiques, où les programmes sont configurés pour réaliser le procédé de commande selon l'une quelconque des revendications 8 à 12 lorsqu'ils sont exécutés par le dispositif de commande du climatiseur selon la revendication 1.

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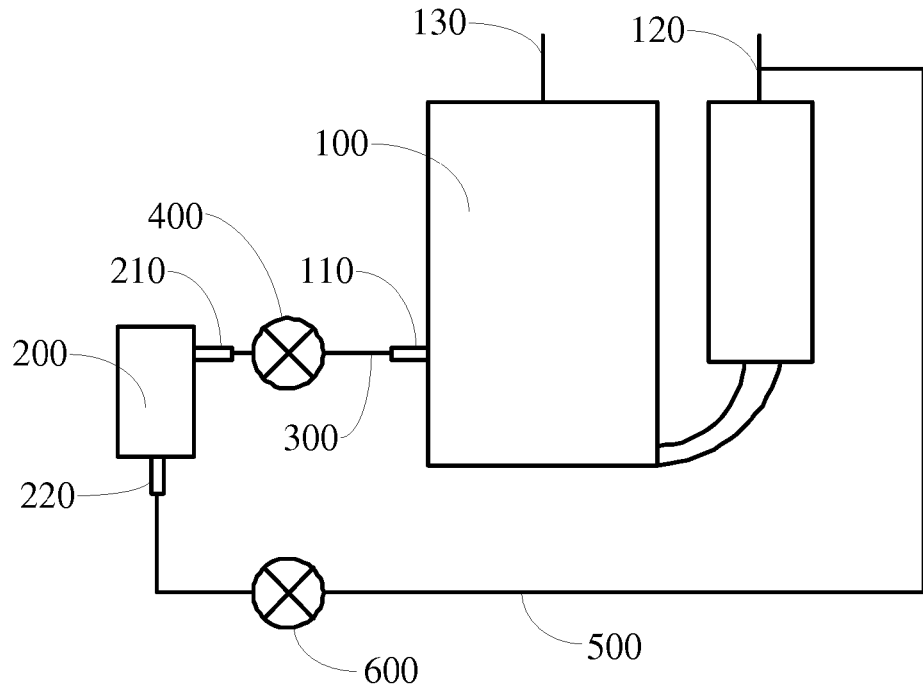


Fig. 1

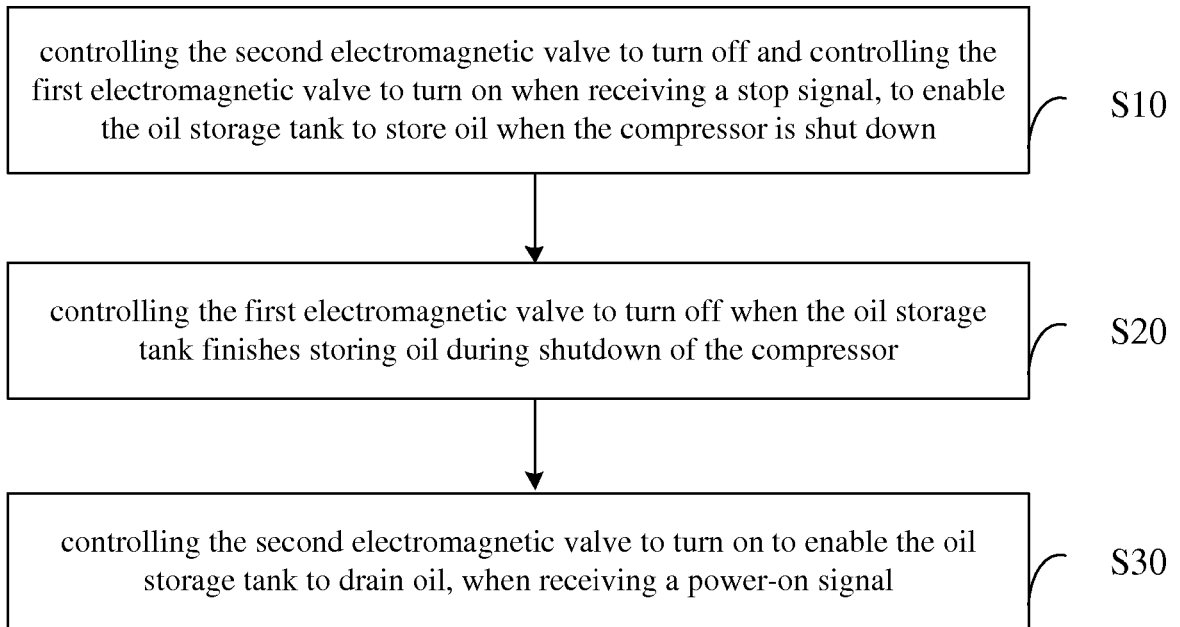


Fig. 2

REFERENCES CITED IN THE DESCRIPTION

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