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(54) **Indoor embedded type heat source machine**

In einen Innenraum eingebaute Wärmequellenmaschine

Machine à source de chaleur de type intégré pour intérieur

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Description

BACKGROUND OF THE INVENTION

[0001] The present invention relates to an indoor embedded type heat source machine embedded in a ceiling of a building or the like, and more particular, to an indoor embedded type heat source machine having a drain pan.

[0002] Generally, while an outdoor equipment (heat source machine) of an air conditioner is mounted outdoors, an air conditioner of a type, of which a heat source machine is mounted in the interior of a building, is desired by scene control regulations or the like in recent years. Accordingly, it is required that a heat source machine be thin and lightweight to enable mounting in a ceiling, a clearance of which is narrow.

[0003] Also, in a heating operation, a heat source machine performs a defrosting operation for removal of frost and ice, which adhere to a heat exchanger. Therefore, a drain water is generated in the defrosting operation. Since a heat source machine is normally mounted outdoors, a drain water is not subjected to special treatment but is drained outdoors by gravity. Since an indoor embedded type heat source machine is mounted in a ceiling of a building or the like, however, it is necessary to retain a drain water in a drain pan to drain the same outside. At this time, it is an important problem to prevent a water from leaking into a room and to prevent a dew condensation water from falling.

[0004] EP 1004 831 A2 describes an air conditioner indoor unit comprising a heat exchanger, a fan, a drain pan provided under the heat exchanger. The drain pan retrieving drain water condensed on the heat exchanger. An outlet nozzle member is provided under the drain, the outlet nozzle member providing an air path for blowing off air supplied by the fan and a hollow space between the drain pan and the outlet nozzle member. A drain pan drainage is formed in the drain pan.

[0005] JP-A-62-186142 describes a conventional technology. A ceiling embedded type heat source machine shown in the document is provided in a ceiling space together with an indoor unit and an outdoor unit. In a heating operation, a drain water generated by a heat-source side heat exchanger is conducted to a utilization side heat exchanger through a drain pipe to be evaporated to humidify an interior of a room and a drain water being not evaporated is discharged outside the room by a drain pump. In a cooling operation, a drain water generated by the utilization side heat exchanger is characteristically discharged outside the room by the drain pump.

[0006] However, it is not adequately taken into consideration to thin the construction described in JP-A-62-186142 when indoor and outdoor units are mounted indoors. Also, a drain water collected in a drain pan of the outdoor unit is only conducted to the indoor unit and it is not adequately taken into consideration to surely drain a drain water in any situation.

Summary of the Invention

[0007] It is an object of the invention to provide an indoor embedded type heat source machine capable of efficiently draining a drain water collected in a drain pan provided on a thin, compact cabinet.

[0008] The object is achieved by the invention according to claim 1. The dependent claims describe further preferred developments.

[0009] Also, the drain pan in the indoor embedded type heat source machine preferable comprises means for detection of a drain water retained therein.

[0010] Also, the drain pan in the indoor embedded type heat source machine preferably comprises a drain pump that receives an electric signal from the detection means to start or stop an operation, in which a drain water is drawn up.

[0011] Also, the drain pan in the indoor embedded type heat source machine preferably comprises a heater.

[0012] Also, an antibacterial treatment is preferably applied to the drain pan in the indoor embedded type heat source machine.

[0013] Also, the drain pan in the indoor embedded type heat source machine is preferably arranged on a reinforcement member provided in a lower portion of the cabinet.

[0014] According to the invention, owing to a construction, in which a cabinet mounted in an interior of a building is partitioned into an air inlet space and an air outlet space by a separating plate, a fan is provided on a side of the air inlet space toward the separating plate, a compressor is provided in the air inlet space in a manner to make a length direction thereof substantially in parallel to the ceiling or the like, in which it is embedded, and which comprises a heat exchanger between the fan and the compressor, a drain pan provided below the compressor to have drainage means, and a heat-exchanger separating plate that partitions the drain pan into a side, on which an air flows into the heat exchanger, and a side, on which an air flows out from the heat exchanger, it is possible to obtain an indoor embedded type heat source machine constructed to have a thin, compact cabinet. Further, the drain pan partitioned into a side, on which an air flows into the heat exchanger, and a side, on which an air flows out, by the heat-exchanger separating plate produces an effect of enabling efficiently draining a drain water from drainage means since the side, on which an air flows out, becomes negative in pressure to collect a drain water.

Brief Description of the Drawings

[0015]

Fig. 1 is a view showing the construction of configuration of Embodiment 1 of an indoor embedded type heat source machine according to the invention;
Fig. 2 is a view illustrating the configuration of a refrigerating cycle in Embodiment 1;

Fig. 3 is a view showing the construction of configuration of the neighborhood of a drain pan shown in Fig. 1;

Fig. 4 is a view showing how a crankcase heater on a back surface of the drain pan shown in Fig. 3 is mounted;

Fig. 5 is a view as viewed in a direction of an arrow A-A in Fig. 3 in the case where a float switch is mounted;

Fig. 6 is a view as viewed in the direction of the arrow A-A in Fig. 3 in the case where a drain pump is mounted; and

Fig. 7 is a view showing the construction of a bottom plate of a cabinet shown in Fig. 1.

Description of the Preferred Embodiment

[0016] Embodiments according to the invention will be described below with reference to the drawings.

[Embodiment 1]

[0017] An indoor embedded type heat source machine according to an embodiment is constructed such that a separating plate 17 compartments an air inlet space provided with an air inlet 10 and an air outlet space provided with an air outlet 11 as shown in Fig. 1. Arranged in the air inlet space are a compressor 1, a receiver 6, a heat exchanger 2, a fan motor 3, and a fan 4. Also, a reversing valve, an outdoor expansion valve, cycle piping, etc., which constitute a refrigerating cycle, are provided in the air inlet space and a drain pan 9 is arranged below the heat exchanger 2. On the other hand, an electrical box 5 is arranged in the air outlet space. Fig. 1 shows the case where the machine is suspended in, for example, the ceiling.

[0018] Fig. 2 is a view illustrating the configuration of a refrigerating cycle in the embodiment. A refrigerating cycle is constituted by successively connecting the compressor 1, the reversing valve 7, the heat exchanger 2, and the receiver 6 in tube-in-tube and circulating a refrigerant.

[0019] Fig. 3 shows the drain pan 9 of the indoor embedded type heat source machine according to the embodiment. When an air conditioner performs a heating operation, a dew condensation water adheres to the heat exchanger 2. Also, since a water content and a dew condensation water adhering to the heat exchanger freeze when an outside air is low in temperature, a defrosting operation is carried out periodically to perform thawing and defrosting. Therefore, a large quantity of drain water is generated. Since an outdoor equipment of a general air conditioner is mounted outdoors, a drain water is drained by gravity but an indoor embedded type heat source machine is mounted indoors, so that it is essential to retain a drain water in the drain pan 9 and to discharge the drain water by means of a drain hose, or the like.

[0020] Since the heat exchanger 2 is L-shaped, the drain pan 9 is also made L-shaped. Also, a drain boss (drain discharge port) 9a for discharge of a drain water is provided on a side or a bottom surface of the drain pan 9. The drain boss 9a may be provided in a single location or several locations. In the case where the drain bosses 9a are provided in several locations, a water is hard to leak even if the drain boss in a location is plugged with foreign matters, and a direction, in which a drain water is discharged, can be optionally changed according to a location, in which a cabinet 18 is mounted.

[0021] Since a drain water is stored in the drain pan 9, it is preferable to apply a rustproof treatment, coating treatment, or the like in the case where a drain pan is made of sheet metal. Also, in the case where a long period of time elapses as a drain water is left in the drain pan 9, mold and bacteria propagate in the drain water to lead to the generation of foreign matters on slime and odor in some cases. Hereupon, in order to suppress the generation of bacteria or the like, an antibacterial treatment may be applied on surfaces of the drain pan 9.

[0022] Arrows in Fig. 3 indicate flow of an air flowing from the air inlet, a side, on which an air flows into the heat exchanger 2, being referred to as a heat-exchanger primary side, and a side, on which an air flows out from the heat exchanger 2, being referred to as a heat-exchanger secondary side. The heat-exchanger primary side and the heat-exchanger secondary side are partitioned by heat-exchanger separating plates 2a, 2b.

[0023] The drain boss 9a, for discharge of a drain water, provided on the drain pan 9 is arranged on the heat-exchanger secondary side. According to the embodiment, the fan motor 3 and the fan 4 are arranged on the heat-exchanger secondary side of the drain pan 9 partitioned by the heat-exchanger separating plates 2a, 2b, so that the heat-exchanger secondary side is made negative in pressure upon the operation of the fan. Therefore, a drain water stored in the drain pan 9 is caused by the negative pressure to rise in water level on the heat-exchanger secondary side. Accordingly, when the drain boss 9a is provided on the heat-exchanger secondary side, a drain water is well drained. While the provision of a plurality of drain bosses 9a as in the embodiment achieves an improvement in quality of drainage, the drain bosses 9a are preferably provided on an opposite side of the cabinet 18 to the air inlet 10 for reasons of installation of a distributing water pipe (not shown) and maintenance.

[0024] In addition, according to the embodiment, the indoor embedded type heat source machine is installed so that the compressor 1 is laid down on the ceiling but the indoor embedded type heat source machine may be embedded in, for example, a floor or a wall. In case of being provided on a wall, the indoor embedded type heat source machine is installed so that the compressor 1 is made substantially in parallel to the wall.

[0025] In the case where a heating operation is to be performed when an outside air is low in temperature, the heat exchanger 2 is lowered to or below 0 °C in temper-

ature and a drain water temporarily stored in the drain pan 9 freezes in some cases. Ordinarily, a defrosting operation is performed to raise the heat exchanger 2 in temperature to melt ice in the heat exchanger 2 and the drain pan 9 but ice cannot be completely melted but remains in some cases in the case where an outside air is low in temperature. When ice remains, ice accumulates with the lapse of time and the whole drain pan 9 freezes to finally lead to leakage of water from the drain pan 9.

[0026] By providing a crankcase heater 14 on a bottom surface (an opposite side to a surface, on which a drain water is collected) of the drain pan 9 as shown in Fig. 4, it is possible to prevent the drain pan 9 from freezing. When the crankcase heater 14 is lowered to or below a predetermined temperature, an electric current may be carried to the crankcase heater 14 by a signal from a temperature sensor mounted to the heat exchanger 2.

[Embodiment 2]

[0027] Fig. 5 shows a drain pan according to Embodiment 2 of the invention and corresponds to a view as viewed in a direction of an arrow A-A in Fig. 3. The drain pan 9 in Embodiment 1 permits drainage by gravity from the drain bosses 9a. Therefore, in the case where dust accumulates on the drain pan 9 and mold generates on the drain pan 9 to leave slime-like foreign matters, the drain bosses 9a are plugged to lead to a decrease in performance of drainage. In order to prevent leakage of water from the drain pan 9 in this case, a float switch 12 is mounted in the embodiment to issue an alarm in the case where the drain pan 9 becomes abnormal in water level as shown in Fig. 5 or the operation of an outdoor equipment is stopped. At this time, an indoor equipment is also stopped in operation or an air blasting operation is performed.

[0028] It is simply required that the float switch 12 be fixed by means of a fixing plate 13. It is required that a level, at which the float switch 12 is mounted, with reference to a lower surface of the drain pan 9 be made one, at which an alarm is issued in case of abnormal water level, and one, at which the float switch 12 is not actuated in normal operation. Also, it is simply required that the float switch 12 be mounted on the secondary side of the heat exchanger 2.

[Embodiment 3]

[0029] Fig. 6 shows an example, in which a drain pump 15 is provided on a drain pan 9 to draw up a drain water stored in the drain pan 9. The drain pump 15 is fixed by means of a fixing plate 16. A drain water drawn up by the drain pump 15 is drained through a drain hose 19. It suffices that the drain pump 15 be operated receiving a signal when the float switch 12 operates. Also, it suffices that an operation of the drain pump 15 be stopped receiving a signal when the operation of the float switch 12 (see Fig. 5) is released. Since the drain pump 15 is mounted to enable lifting a drain water by a pump head of 700 mm at maximum, there is an advantage that execution of drain piping is improved in flexibility, or the like.

[0030] Also, since a drain water from the heat exchanger 2 is stored in the drain pan 9, a load is placed on the drain pan 9. Hereupon, as shown in Fig. 7, in order to prevent the drain pan 9 from bending, it is preferred that the drain pan 9 be arranged on a transverse reinforcement member 8a and a longitudinal reinforcement member 8b, which are provided on a bottom plate 8. Drain-pan fixing stays 9b are mounted to the drain pan 9, and the bottom plate 8 and the drain pan 9 are clamped together by means of screws or the like.

[0031] In the case where a drain water is very large in quantity, the drain water overflows from the drain pan 9 to lead to leakage of water from an outdoor equipment. Hereupon, a drain water can be retained by bending four end surfaces of the bottom plate 8 disposed on a lowermost surface of the cabinet 18 to form a box from the same. When the bottom plate 8 thus formed is used, the bottom plate 8 can retain a water to prevent leakage of water from the indoor embedded type heat source machine even if a water leaks from and a dew condensation water drops from the drain pan 9.

[0032] Features, components and specific details of the structures of the above-described embodiments may be exchanged or combined to form further embodiments optimized for the respective application.

Claims

1. An indoor embedded type heat source machine comprising
a cabinet (18) mounted in an interior of a building and embedded in a ceiling, a floor, or a wall, which surrounds an air-conditioning object environment,
a separating plate (17) that partitions the cabinet (18) into an air inlet space and an air outlet space,
an air inlet (10), through which an air is drawn into the air inlet space,
an air outlet (11), through which an air is blown off from the air outlet space,
a fan (4) provided on a side of the air inlet space toward the separating plate (17) to blow off an air into the air outlet space from the air inlet space,
a drain pan (9) provided below the heat exchanger (2) to have drainage means, and
a heat-exchanger separating plate (2a, 2b) that partitions the drain pan (9) into a heat-exchanger primary side, on which an air flows into a heat exchanger (2), and a heat-exchanger secondary side, on which an air flows out from the heat exchanger (2),
characterized by
a compressor (1) provided in the air inlet space and arranged to make a length direction thereof in parallel to a surface of the ceiling, the floor, or the wall, in which it is embedded, wherein

the heat exchanger (2) is provided between the fan (4) and the compressor (1), and
the fan (4), a fan motor (3) and the drainage means are arranged on the heat-exchanger secondary side.

2. The indoor embedded type heat source machine according to claim 1, wherein the drain pan (9) comprises means for detection of a drain water retained therein.

3. The indoor embedded type heat source machine according to claim 2, wherein the drain pan (9) comprises a drain pump (15) that receives an electric signal from the detection means to start or stop an operation, in which a drain water is drawn up.

4. The indoor embedded type heat source machine according to claim 1, wherein the drain pan (9) comprises a heater (14).

5. The indoor embedded type heat source machine according to claim 1, wherein an antibacterial treatment is applied to the drain pan (9).

6. The indoor embedded type heat source machine according to claim 1, wherein the drain pan (9) is arranged on a reinforcement member provided in a lower portion of the cabinet (18).

Patentansprüche

1. Wärmequellenmaschine des im Gebäude eingebetteten Typs, die Folgendes umfasst:

ein Gehäuse (18), das im Innenraum eines Gebäudes montiert ist und in eine Decke, einen Boden oder eine Wand, die bzw. der eine Umgebung eines Klimatisierungsobjekts umgibt, eingebettet ist,
eine Trennplatte (17), die das Gehäuse (18) in einen Lufteinlassraum und einen Luftauslassraum trennt,
eine Lufteinlass (10), durch den Luft in den Lufteinlassraum gesaugt wird,
eine Luftauslass (11), durch den Luft aus dem Luftauslassraum gefördert wird,
ein Gebläse (4), das auf einer Seite des Lufteinlassraums in Richtung zu der Trennplatte (17) vorgesehen ist, um Luft von dem Lufteinlassraum in den Luftauslassraum auszublasen,
eine Entleerungswanne (9), die unter dem Wärmetauscher (2) vorgesehen ist und Entleerungsmittel besitzt, und
eine Wärmetauscher-Trennplatte (2a, 2b), die die Entleerungswanne (9) in eine Wärmetauscher-Primärseite, auf der Luft in einen Wärmetauscher (2) strömt, und eine Wärmetauscher-Sekundärseite, auf der Luft aus dem Wärmetauscher (2) strömt, unterteilt,
gekennzeichnet durch
einen Kompressor (1), der in dem Lufteinlassraum vorgesehen ist und so angeordnet ist, dass seine Längsrichtung zu einer Oberfläche der Decke, des Bodens oder der Wand, in die bzw. den er eingebettet ist, parallel ist, wobei
der Wärmetauscher (2) zwischen dem Gebläse (4) und dem Kompressor (1) vorgesehen ist und das Gebläse (4), ein Gebläsemotor (3) und die Entleerungsmittel auf der Wärmetauscher-Sekundärseite angeordnet sind.

2. Wärmequellenmaschine des im Gebäude eingebetteten Typs nach Anspruch 1, wobei die Entleerungswanne (9) Mittel umfasst, um darin gehaltenes Entleerungswasser zu detektieren.

3. Wärmequellenmaschine des im Gebäude eingebetteten Typs nach Anspruch 2, wobei die Entleerungswanne eine Entleerungspumpe (15) umfasst, die von den Detektionsmitteln ein elektrisches Signal empfängt, um einen Betrieb, in dem Entleerungswasser hochgesaugt wird, zu beginnen oder anzuhalten.

4. Wärmequellenmaschine des im Gebäude eingebetteten Typs nach Anspruch 1, wobei die Entleerungswanne (9) eine Heizeinrichtung (14) enthält.

5. Wärmequellenmaschine des im Gebäude eingebetteten Typs nach Anspruch 1, wobei auf die Entleerungswanne (9) eine antibakterielle Behandlung angewendet wird.

6. Wärmequellenmaschine des im Gebäude eingebetteten Typs nach Anspruch 1, wobei die Entleerungswanne (9) auf einem Verstärkungselement angeordnet ist, das in einem unteren Bereich des Gehäuses (18) vorgesehen ist.

Revendications

1. Machine formant source de chaleur de type intégrée pour installation en intérieur, comprenant :

une carrosserie (18) montée à l'intérieur d'un bâtiment et intégrée dans un plafond, un plancher, ou un mur, qui entoure un environnement faisant l'objet d'un conditionnement d'air,
une plaque de séparation (17) qui cloisonne la carrosserie (18) en un espace d'entrée d'air et un espace de sortie d'air,
une entrée d'air (10), à travers laquelle de l'air est aspiré jusque dans l'espace d'entrée,
une sortie d'air (11), à travers laquelle de l'air

est soufflé hors de l'espace de sortie d'air,
un ventilateur (4) prévu sur un côté de l'espace d'entrée d'air en direction de la plaque de séparation (17) pour souffler de l'air vers l'espace de sortie d'air en provenance de l'espace d'entrée d'air,
une cuve de drainage (9) prévue au-dessous de l'échangeur de chaleur (2) et comportant un moyen de drainage, et
une plaque de séparation d'échangeur de chaleur (2a, 2b) qui cloisonne la cuve de drainage (9) en un côté primaire de l'échangeur de chaleur, sur laquelle de l'air s'écoule jusque dans un échangeur de chaleur (2), et un côté secondaire de l'échangeur de chaleur, sur lequel de l'air s'écoule hors de l'échangeur de chaleur (2),
caractérisée par
un compresseur (1) prévu dans l'espace d'entrée d'air et agencé pour rendre une direction en longueur de celui-ci parallèle à une surface du plafond, du plancher ou du mur, dans lequel il est intégré, dans lequel l'échangeur de chaleur (2) est prévu entre le ventilateur (4) et le compresseur (1), et
le ventilateur (4), un moteur de ventilateur (3), et le moyen de drainage sont agencés sur le côté secondaire de l'échangeur de chaleur.

2. Machine formant source de chaleur de type intégrée pour installation en intérieur selon la revendication 1, dans laquelle la cuve de drainage (9) comprend un moyen pour la détection de l'eau de drainage retenue à l'intérieur.

3. Machine formant source de chaleur de type intégrée pour installation en intérieur selon la revendication 2, dans laquelle la cuve de drainage (9) comprend une pompe de drainage (15) qui reçoit un signal électrique depuis le moyen de détection pour démarrer ou pour arrêter un fonctionnement, dans lequel de l'eau de drainage est aspirée.

4. Machine formant source de chaleur de type intégrée pour installation en intérieur selon la revendication 1, dans laquelle la cuve de drainage (9) comprend un chauffage (14).

5. Machine formant source de chaleur de type intégrée pour installation en intérieur selon la revendication 1, dans laquelle un traitement antibactérien est appliqué à la cuve de drainage (9).

6. Machine formant source de chaleur de type intégrée pour installation en intérieur selon la revendication 1, dans laquelle la cuve de drainage (9) est agencée sur un élément de renforcement prévu dans une portion inférieure de la carrosserie (18).

FIG. 1

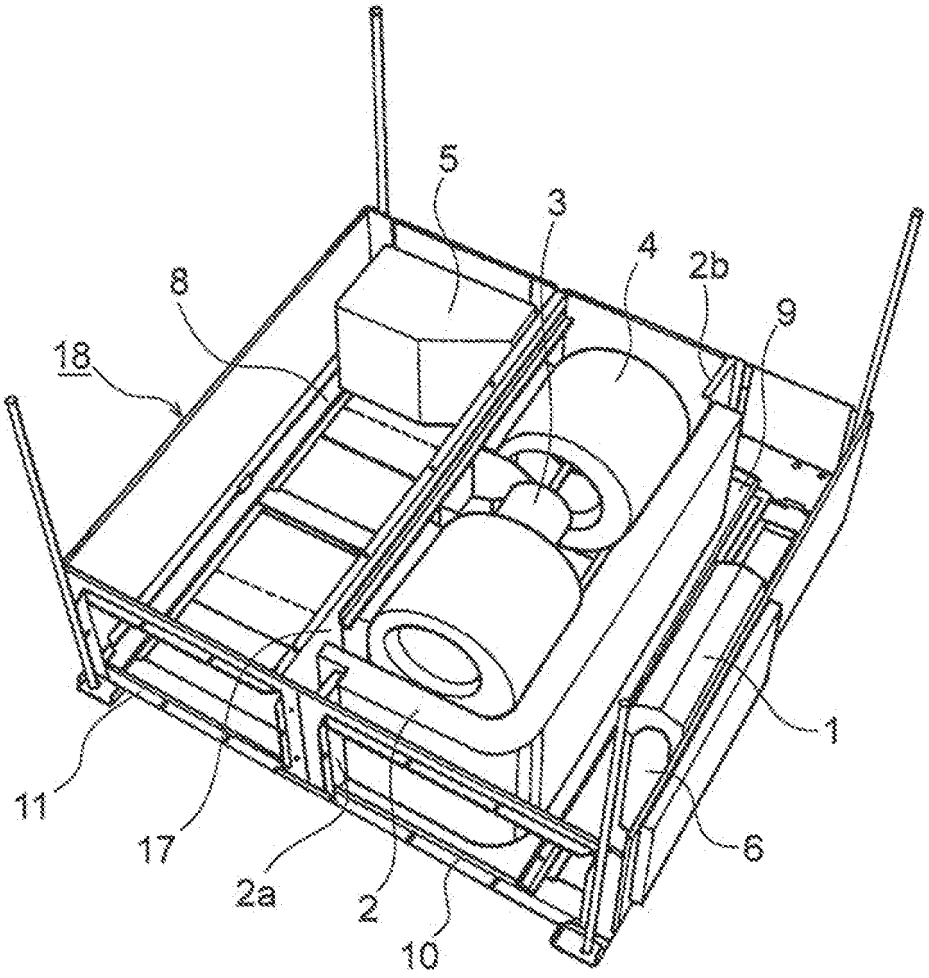


FIG. 2

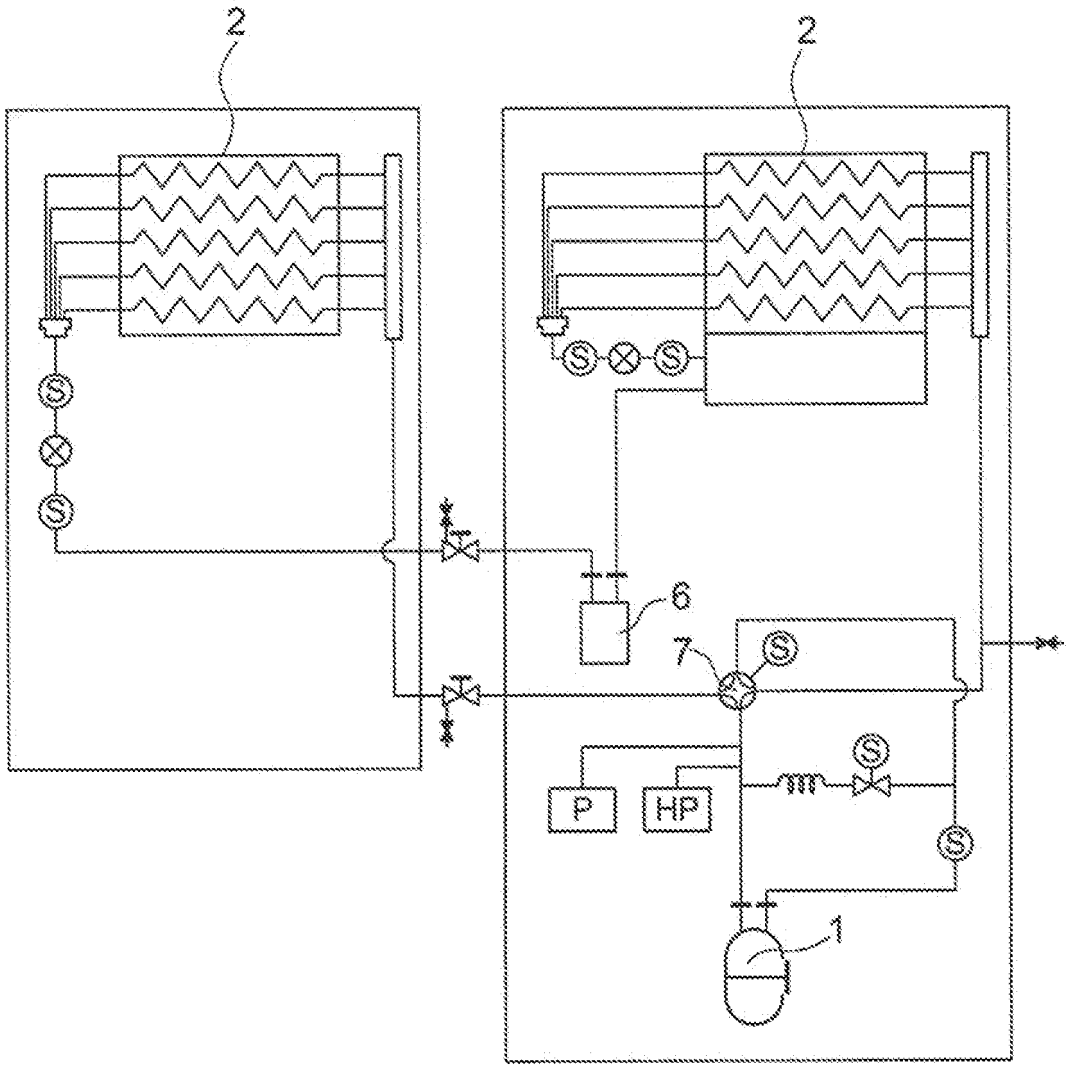


FIG. 3

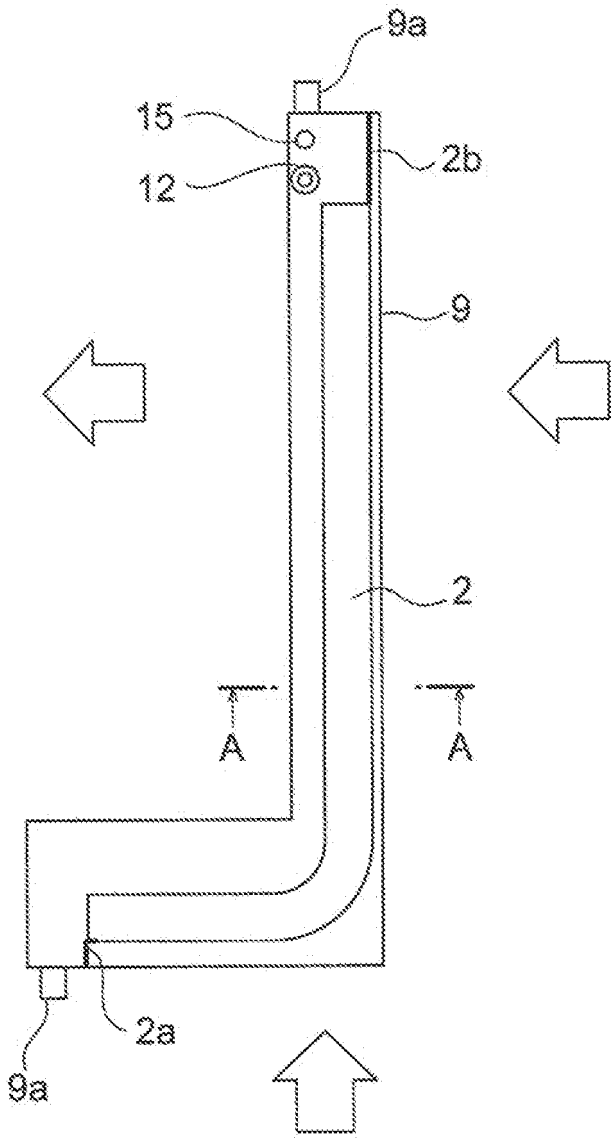


FIG. 4

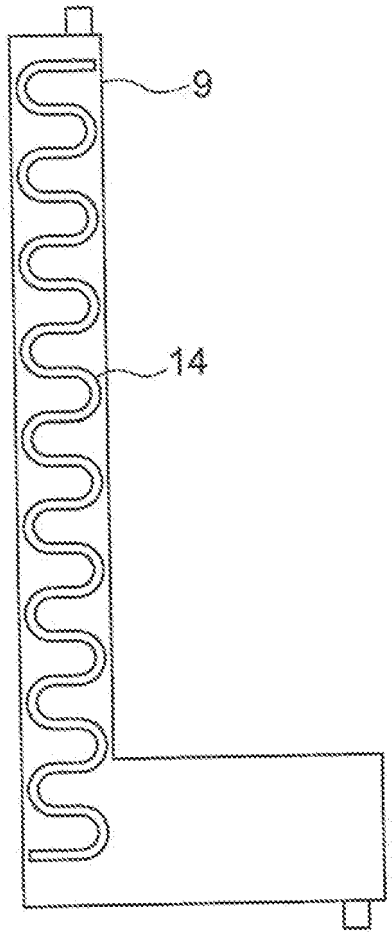


FIG. 5

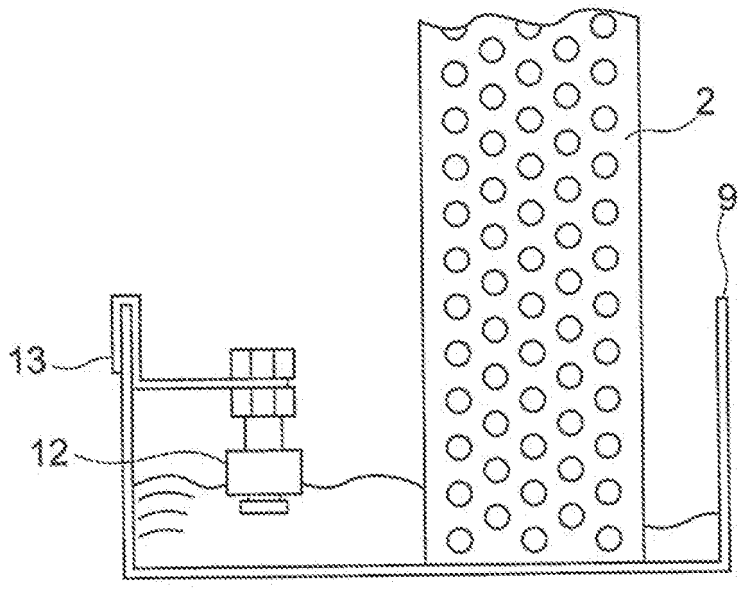


FIG. 6

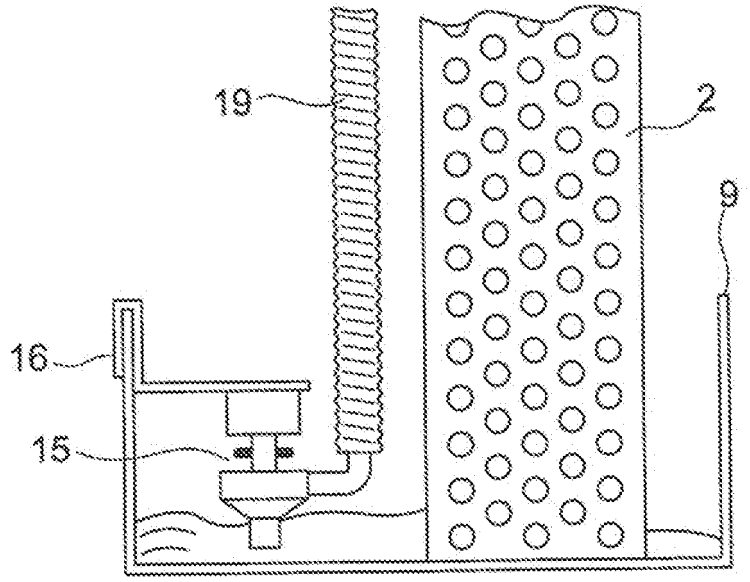
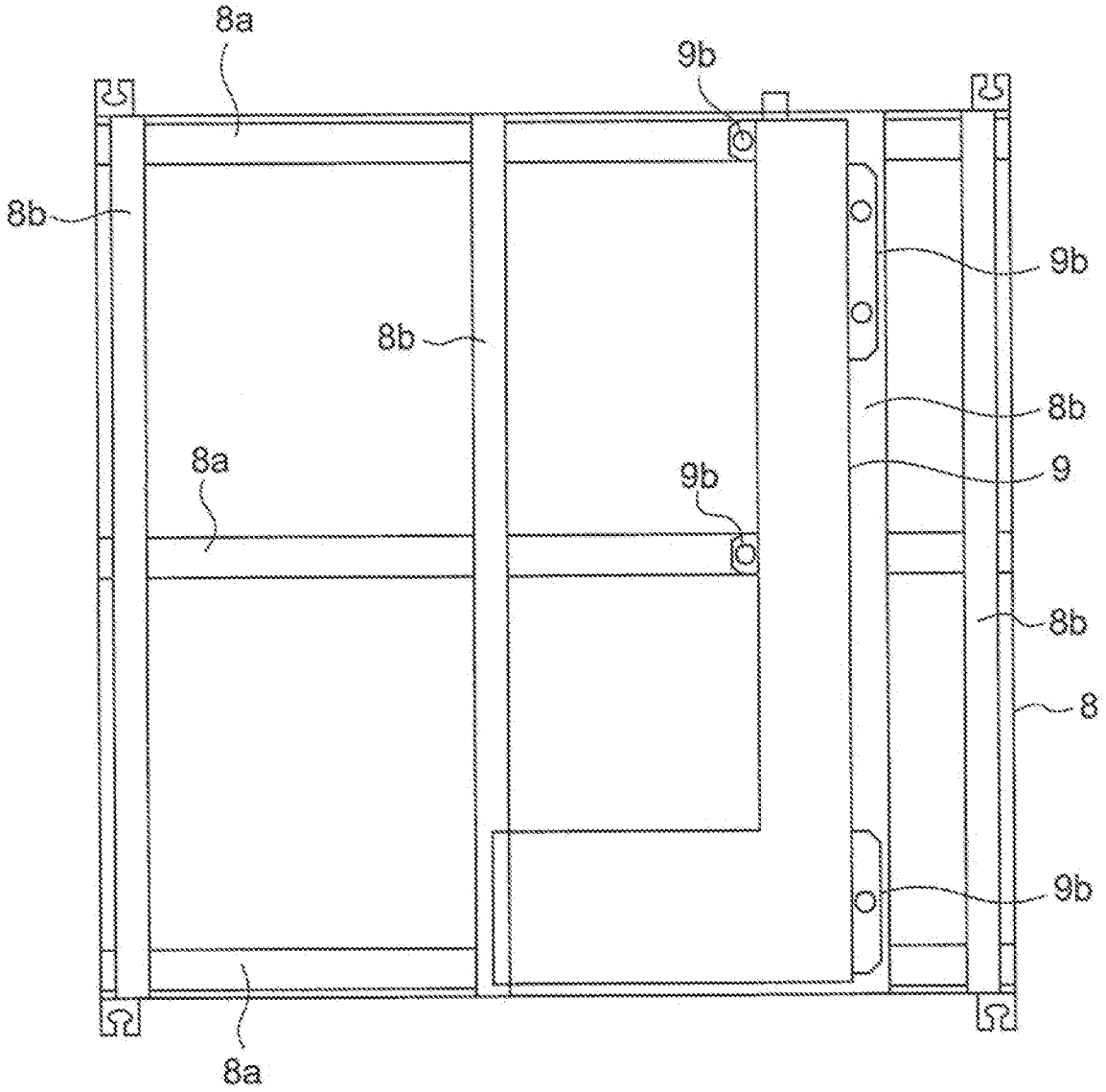


FIG. 7



REFERENCES CITED IN THE DESCRIPTION

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